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# EDITORIALS

## THE LIGHTING OF STEEL MILLS.

Recent developments in lighting units have probably affected no other application of electric lighting more extensively than the illumination of steel mills. Special requirements arise in plants of this type owing to the necessity of headroom for the operation of cranes, to the size of the buildings concerned, to the prevalence of an unusual quantity of dirt, to the existence of fumes in the air in certain departments, etc. There is no application for units of low wattage except for certain cases of localized lighting. The general requirement is for units of high candlepower with high mounting. This does not, however, greatly restrict the choice of units. Flaming-arc lamps, mercury-vapor lamps and gas-filled incandescent lamps are all able to meet the requirements imposed in this class of work and there is no general agreement as to which type of installation will give the most general satisfaction. Examples of each type are in existence. One of the most recently constructed plants, that of the Minnesota Steel Company, has preferred the quartz-tube mercury-vapor lamp. This installation is described on another page. On the other hand, the Illinois Steel Company has installed at its South Chicago plant the gas-filled type of incandescent lamp. This is one of the most progressive works in the country from the electrical standpoint, as shown by its early installation of an electrically driven reversing rolling mill, which is illustrated in this issue, and its adoption of the electric furnace for producing high grades of steel. In addition to the two 15-ton three-phase Heroult arc furnaces now in operation, two 20-ton furnaces of the same type are soon to be installed.

## LAMP RENEWALS.

At the time the tungsten-filament lamp, with its great improvement in efficiency over the previous carbon-filament lamp, was placed on the market it was the policy of a large proportion of the central stations of this country to renew incandescent lamps of the more common sizes free of charge. While this policy was continued with respect to carbon lamps, the new lamps were not at first included in the scheme, and it was not for some years that any free renewals were made with the new type of lamp. After a few years, when the ruggedness of the tungsten lamp had been improved so that breakages became infrequent, and when the fear of disastrous results upon the income of the central station had been allayed, a few of the more progressive companies began to consider the possibility of free renewals of tungsten lamps and at the present time such a policy has been adopted by a considerable number of them. It seems likely that this policy will soon receive general adoption.

The advantages of such a policy are manifest and were generally recognized when free renewals of carbon lamps were first adopted. Under this policy almost all of the lamps which are placed in service are received through the hands of the central station and the latter has a direct check upon the quality and the voltage rating of the lamps installed. Moreover, the central station has a greater field for service in the capacity of advising customers as to the best types of installation to meet their requirements and in this way can encourage the general introduction of better lighting methods and more generous lighting intensities. The use of larger units, often needed, but not introduced by consumers without encouragement, can thereby be facilitated to the mutual advantage of both customer and central station. Proposals for better lighting, however, will fall upon deaf ears unless high-efficiency lamps can be used and it is to the interest of the central-station company to be in a position to introduce these lamps upon the same basis as carbon or Gem lamps. One consideration which should not be overlooked in this connection is that the variation in candlepower of a tungsten lamp with voltage is not nearly so great as in the case of a carbon lamp. This means that such close regulation of the line voltage is not necessary to secure the same quality of service, or, if the same regulation is maintained, the steadiness of the light is improved and the service thus made more satisfactory. The experience of certain central stations has definitely shown that there are fewer complaints arising from unsteadiness of light where tungsten lamps are in service than were previously received during the use of carbon lamps.

A number of central stations are giving free renewals of tungsten lamps of the larger household sizes, such as those consuming 50 and 60 watts. Others are also giving free renewals in smaller sizes, and nearly all supply the smaller lamps at a reduced price if free renewals are not given. In Detroit new installations are supplied with an outfit of Mazda lamps free of charge, but such a supply is limited to 20 for any one residence. This keeps the burden upon the central-station company from becoming too large, while the general use of 40-watt lamps, which is the size supplied

free, tends to prevent the consumption of energy from declining to a point lower than would be experienced with carbon lamps, as has generally been found to be the case where customers have to purchase lamps and from a sense of economy install the smaller sizes of tungsten lamps. When tungsten lamps are secured from an outside source, the tendency toward economy is likely to predominate, whereas if the central station supplies free renewals of the larger sizes of tungsten lamps, the energy consumed will undoubtedly be larger and the general scale of residence illumination will be of a higher order.

## THE ORGANIZATION OF SCIENCE IN ENGLAND.

During the last few months, since our last reference in these pages to the movement for organizing the leading manufacturing and industrial concerns of the United Kingdom into one strong federation, great progress has been made. A couple of years ago under the influence of the humiliation that followed the people's awakening to the fact that neither the scientific experience and knowledge, nor the industrial facilities, were organized for rapid adaptation to the emergency of a great war, there were some enthusiasts who thought that the matter could be remedied for the future by establishing one big national association or institute which should watch over the whole scientific and industrial policies, operations, and interests, of Great Britain. Others regarded such propositions as being wrongly and over ambitiously conceived, and the machinery involved as far too cumbersome, or, changing the figure, regarded the ship as likely to be disastrously overloaded.

After a time better counsels prevailed and while it was recognized that for progressive industrial application there must be the support of, and co-operation with, science, it was not thought that the union of the two classes of interest in one association, beyond the extent to which a goodly proportion of leaders in a number of industries are usually of scientific experience and sympathies, was an absolute essential. There has therefore been developed a very powerful organization, known as the Federation of British Industries, in which most of the great electrical and general engineering companies have shown a practical sympathy. Between 100 and 200 firms or corporations are understood to have pledged themselves to subscription membership running into $5,000 each. This will ensure the Federation having a substantial capital fund which will stand it in good stead, enabling it to develop its activities on an appropriately grand scale, representing the voice and sentiments of united industry with the Government, with organized labor, with scientific bodies, and so forth.

Side by side with this industrial organization, whose objects cover a very wide range of subjects, there has been proceeding the setting up of an important Board of Scientific Societies, and with this representative scientific board it should be possible for the leaders of science readily to confer with the leaders of federated industry with the object of securing the most efficient co-operation. The Board held its first meeting in August. It comprises members drawn from, and representing, 27 technical and scientific societies; and it was formed on the initiative of the Royal Society, whose president, Sir Joseph Thomson, is its first executive chairman. In the program that is set before it there is the promotion of co-operation of those interested in pure or applied science; it aims at being a means by which the scientific opinion of England may, on matters relating to science, industry, and education, find effective expression; it will take such action as may be necessary to promote the application of science to industry and to the service of the nation; it will, further, discuss scientific questions in which international co-operation seems advisable.

At the inaugural meeting of the Board the discussion centered round the need that exists for taking effective steps for co-ordinating the work carried out at present by a number of independent bodies. One result of such deliberations will probably be direct touch with the Federation of British Industries. Consolidation of these two bodies in one organization is not probable, nor desirable. Co-operative action will enable them to assist the causes of both science and industry, the while each organization preserves its own peculiar character for many special purposes which are not common to both.

## CAN INFLAMMABLE OIL BE ELIMINATED FROM ELECTRICAL APPARATUS?

Refined petroleum or mineral oil has found application in the electrical industry in large quantities and notably in transformers and oil switches. The high insulating value of oil combined with its fluidity and suitable values of freezing point, boiling point and flash point and its lack of volatility have made its especially suitable for such purposes. In addition it serves as a lubricant of the contacts of immersed switches. Mineral oil has one drawback, however, and that is its inflammability, and a number of destructive fires can be attributed to the presence of this material in considerable quantities in power houses and substations. It would seem as if there ought to be some material which will combine the desirable properties of mineral oil with freedom from inflammability, but as yet such a substance does not seem to be available. An attractive and profitable field opens itself here to the research chemist.

That the problem is not one without a hope of solution is indicated by some tests recently made in Germany and described in the *Elektrotechnische Zeitschrift*. The material experimented with was carbon tetrachloride. This liquid is non-inflammable and non-explosive. It has a boiling point of 78 degrees centigrade and is decomposed at a temperature of about 290 degrees. Its specific gravity is about 1.6. It is colorless and has an agreeable aromatic odor. It is a good insulator and its dielectric strength is not much different from that of mineral oil. While it is possible to use this substance

as a substitute for oil in electrical apparatus, it has two disadvantages. One is its volatility and the other is that it acts chemically upon copper, rubber and certain other materials. However, aluminum, mica and fiber do not seem to be affected by it. To overcome its volatility, experiments were made by covering it with a layer of glycerine, but this did not prove entirely satisfactory.

The author of the article referred to, Mr. M. Vogelsang, suggested that a mixture of oil and carbon tetrachloride, which would combine somewhat the properties of the two, might be useful. A mixture of three parts of the former with one of the latter is not very inflammable and volatilizes very slowly, so that it might prove useful. The greatest value of these experiments, however, seems to be in suggesting the possibility of finding some substance whose properties will meet all of the requirements of the case.

## THE ELECTRON THEORY OF MATTER.

The remarkable developments of the last 20 years in the field of physical research and the new ideas which have been brought into existence through the study of electrical discharges in gases, Roentgen rays and radioactivity have furnished conceptions of the atom which represent a new epoch in scientific thought. For a long time chemists have held the conception of an atom which was indestructible and indivisible, and which represented the smallest quantity of matter which could exist alone. This idea was rudely shattered by the discoveries which resulted from an investigation of radioactive substances. These experiments showed that certain chemical elements broke down into other elements, the process being accompanied by the giving off of what have been known as alpha, beta and gamma rays, which have more recently been identified as helium atoms, negative electrons and Roentgen rays. The atom can consequently no longer be regarded as indivisible or eternally representing a single chemical element. Otherwise, however, their conception of the properties of the atom require little modification, but recent investigations have thrown considerable light upon the probable constitution of the atom and modern theory conceives it as being made up of elementary particles of electricity. While this is a subject that might seem to come in the realm of the chemist, it is almost entirely through the experiments of the physicist that the new conceptions have been given birth.

The smallest particle of electricity of which we have any knowledge is known as the electron. Its existence was established through experiments with cathode rays, which showed that such rays consisted of streams of negatively electrified particles whose mass was about 0.00055 of the mass of the hydrogen atom, which hitherto had been regarded as the smallest possible mass. It was later shown by experiments, which cannot be described here, that the mass of these negative electrons was probably electrical in character, since electricity presents the property of inertia in the same way as ordinary matter. It was also shown that the mass of such electrons depends upon their velocity when they move with excessive speeds; in other words, that mass is not a constant quantity. Electrons were later found to be given off by heated bodies, by radioactive substances, etc. The same unit quantity of electricity that constitutes an electron was found to be the smallest amount of positive electricity which could be isolated, but this positive unit was always found to be associated with a mass equal to that of the hydrogen atom and hence many times greater than that of the negative electron.

The modern theory regards an atom as made up of a positively charged nucleus surrounded by one or more negative electrons revolving around it in planetary orbits. What has heretofore been regarded as the diameter of an atom may be regarded rather as the diameter of its sphere of action. Within this sphere of action but a small part of the space is occupied by the nucleus and the electrons, since the nucleus is very minute in comparison with this atomic dimension. Measurements which have been made upon the amount of scattering of a bundle of alpha rays passing through a sheet of gold foil indicated, in the case of that metal, that the nucleus has a diameter about 0.0001 of the diameter of the atom. This nucleus may consequently be smaller than the negative electron itself, and this seems very probable. If the mass of an electrical particle is due entirely to its charge of electricity, then the mass, for the same quantity of electricity, will be inversely proportional to its radius; so a positive unit would have a radius of only 0.00055 of the radius of a negative electron. There is good reason for believing that the nucleus of the hydrogen atom consists of a single unit of positive electricity, while for other elements the nucleus consists of a combination of positive units and negative electrons. In the case of helium there would be four positive units and two negative electrons, thus giving the nucleus a free charge of two positive units. If the elements are arranged in order of their atomic weights, their position in the series will give the number of units of free charge on the nucleus. The nucleus charge for lithium is three; carbon, six; oxygen, eight; etc., being usually one-half of the number representing the atomic weight. The mass of the atom will depend mainly on the number of the massive positive units in the nucleus, but will be affected to a slight extent by the number of negative electrons in the atom and upon their distribution.

While the outline given above may seem to involve considerable speculation, it is surprising to find what a quantity of experimental data exists to support it. Further confirmation of many details has come from experiments with Roentgen-ray spectra, through the investigations of Laue, Moseley, Bragg and others, as referred to in the issue of December 5, 1914.

In neutral or uncharged matter we may regard the atoms as having their full quota of electrons. Positive electricity consists of atoms from which electrons have been separated. Transfers of charge and currents of electricity may ordinarily be regarded as movements of negative electrons.

# Happenings in the Industry

**Report of Indiana Electric Light Association Meeting at Ft. Wayne—Northwest Electric Light and Power Association Discusses Electric Cooking—Pacific Coast Convention of A. I. E. E.—Convention of Pennsylvania Electric Association—Safety Code and the N. E. L. A.—Preliminary Plans for America's Electrical Week**

## Indiana Electric Light Association Considers Many Utility Problems.

The wide range of subjects considered at the eighth annual convention of the Indiana Electric Light Association, which was held at the Anthony Hotel, Fort Wayne, Ind., on September 12 to 14, was typical of the broadening interests of the central-station industry. The convention was fairly well attended.

Its first session was opened on Tuesday morning by President E. J. Condon, of Angola. Samuel W. Greenland, general manager of the Fort Wayne & Northern Indiana Traction Company, delivered an address of welcome. Mr. Condon then presented the annual presidential address, in which he first emphasized the importance of careful consideration of public policy, particularly of the companies' need to give the best possible service at reasonable rates. In spite of some mistakes, commission regulation in Indiana is characterized by fairness. The public impatience for quick decisions in efforts to lower rates does not take account of the extraordinary increase in the costs of materials and labor during the past year or so. Mr. Condon spoke of the economies resulting from the expansion of central-station systems and the supply of large districts through high-tension lines. He believes that the entire state of Indiana could be supplied from five well located and efficient generating plants much more economically than from the multitude of small existing plants, many of which have obsolete equipment. He is strongly in favor of steady progress in serving small towns and rural customers from high-tension lines. This requires careful consideration of inductive disturbances, railway crossings, safety rules, etc. Respecting association matters, Mr. Condon urged the formation of a new class of membership comprising employees of member companies. He felt, however, that the broadening of the association so as to include electric railways, gas and water companies, and other utilities, like the Missouri Association of Public Utilities, would be desirable as avoiding duplication of effort, conserving the financing of association work, and promoting more effective action on general utility problems.

The remainder of the session was devoted to brief reports of the secretary-treasurer and of several standing committees. At the afternoon session the report of the New-Business Committee was presented. Reference was made to the special and very successful convention of new-business representatives held under the auspices of the committee at Kokomo in April. It was recommended that two or more such special new-business meetings be held during the year. The report was discussed by Messrs. MacGregor, Hart, Thurman, Donohue, Greenland, Palmer, Perry, Condon and Brown. On motion it was decided to print in pamphlet form papers presented at the new-business meeting.

Alex. R. Holliday, of Indianapolis, presented a paper on "Some Suggestions on Utility Financing," in which it was pointed out that in Indiana some 80 per cent of the securities authorized in recent years have been in the form of bonds. In six typical cases cited these bonds were sold at 80 to par, thus the rate actually paid for the money ranged from 8.5 down to 6 per cent. It was suggested that if a larger portion of the new capital were issued as common stock it would be possible to secure better rates and conditions for the remainder as bonds in dealing with bankers and bond houses.

J. J. Kline, of the General Electric Company, read a paper on "Electricity and the Farmer," which included extended comments prepared by P. F. Edwards on the increasing cost of farm labor and the decreasing cost of electricity. The need for more intensive farming was also shown. This involves not only application of scientific methods, but more liberal use of machinery, for the operation of which electric power is peculiarly suitable. The advantages of electric motors over the gasoline engines that are so commonly used were shown and a large number of motor applications described and illustrated.

The paper entitled, "Farm, Rural Business and County Road Lighting," by G. K. Wilson was presented on Wednesday morning. This paper gave costs on rural business and urged caution in developing this class of load. The discussion, although somewhat pessimistic, brought out that this business should be acquired gradually. As an incentive to central stations it was pointed out that farmers are spending large sums for isolated house-lighting plants.

The paper by Emmet Ralston on "Maximum Demand Rates and Cost of Service," considered the subject of rates in detail and was ably discussed by P. R. Stockwell, of Indianapolis.

The entertainment features of the convention were much enjoyed. On Tuesday evening the convention delegates were guests of the Fort Wayne & Northern Indiana Traction Company on a trolley ride to Robinson Park, where lunch and entertainment were provided. Wednesday noon the Fort Wayne Works of General Electric Company was host at a luncheon in the works, which were inspected during the afternoon. The annual banquet was given on Wednesday evening at the Anthony Hotel. Special entertainment was also provided for the ladies during convention sessions. A report of the concluding sessions on Thursday will be given in the next issue.

## New Officers for Association of Edison Illuminating Companies.

As noted in our last issue, the thirty-seventh annual convention of the Association of Edison Illuminating Companies, which was held at the Homestead, Hot Springs, Va., September 4 to 7, was one of the most successful in the history of the organization.

One of the notable features of the meeting was the banquet on Thursday evening at which E. W. Rice, Jr., and Guy E. Tripp were the principal speakers. The election of officers for the ensuing year was also announced and the following were declared elected:

President, Peter Junkersfeld, Chicago, Ill.
Vice-president, L. L. Elden, Boston, Mass.
Secretary, George C. Holberton, San Francisco, Cal.
Treasurer, W. W. Freeman, Cincinnati, O.

Executive Committee: Peter Junkersfeld, chairman, Charles L. Edgar, Boston; Walter F. Wells, Brooklyn; W. W. Freeman, Cincinnati; George C. Holberton, San Francisco; Samuel Insull, Chicago; J. W. Lieb, Jr., New York; and L. L. Elden, Boston; Joseph B. McCall, Philadelphia.

## ELECTRIC COOKING DISCUSSED AT SEATTLE.

### Range Committee's Report One of Several Discussed by Northwest Electric Light and Power Association, at Ninth Annual Convention.

The discussion of electric cooking was without doubt the most important feature of the ninth annual convention of the Northwest Electric Light & Power Association which was held at Seattle, Wash., September 6 to 9. The convention was opened on September 6 at 10 a. m., Mayor H. C. Gill delivering the address of welcome. Response was made by N. W. Brockett.

#### Wednesday Afternoon Session.

A paper entitled "The Employee as an Educator of the Public" by Arthur Gunn, president, Wenatchee Valley Gas & Electric Company, was presented and discussed. It was brought out that as great a mistake as can be made in business life is the neglect of the mental and moral intangibles, the problems of personality and psychology in business. The same relations should hold between companies, employees and consumers as hold between friends and individuals who are in harmony. The average consumer comes in contact with just four employees—the contract agent who takes his application, the meter reader who calls periodically, the cashier who receives his payment and the occasional trouble shooter. His impression of the whole organization comes from these four, and if the employees will but recognize the dignity of this responsibility, and if they can be courteous, tactful and patient, the confidence and friendship of the public for the company can be secured.

A paper entitled "Adequate Protection Against the Risks of Obsolescence and Inadequacy" by Leslie Craven, was presented and discussed. This problem was shown to be one of the most intangible and perplexing questions with which utility managers and investors have to deal and is one which is largely peculiar to each plant.

#### Hydroelectric and Transmission Subjects.

On Thursday morning after appointing a nominating committee, President Robinson turned the meeting over to F. D. Nims, chairman of the Hydroelectric and Transmission Committee. M. T. Crawford was then called on and presented his paper on "The Application of the Overhead Line Rules of the Public Service Commissions of the Northwest." This contained a discussion of the principles involved whereby public bodies attempt to provide safety by promulgating rules for construction and operation. It was brought out that better results would be obtained by laws requiring financial responsibility and definitely fixing the liability than by rules which are so unreasonable as to be incapable of complete enforcement. The Washington State rules were shown to be burdensome in many details and the retroactive feature requiring reconstruction of existing lines by 1918 was almost confiscatory to many companies. Data on accidents from overhead lines showed a very small number of them and indicated that construction according to the State law would not have prevented them. The rules increased the cost of new construction in the state from 10 to 25 per cent and so far existing lines in the state have been only about 20 per cent reconstructed. Sketches and specifications were given showing standards of pole-line construction employed for various classes of service by the Puget Sound Traction, Light & Power Company. The National Safety Code, now in preparation, was referred to as an excellent piece of work, more logical than the State rules, but not acceptable to utilities in the Northwest unless the territory was put in a zone whereby only moderate loading stresses were assumed to be necessary and unless it was assured that they would be intelligently applied. A general discussion followed by Messrs. Merwin, Fisken, Brockett, Henderson, Scott and others.

It was brought out by Mr. Fisken that the National Electrical Safety Code had been amended so as to modify the objectionable features a great deal and that it appeared to be on the whole much more acceptable than the present State law, because it was based on sound engineering principles and was susceptible of accurate interpretation whereas the State law was unintelligible in some parts. Mr. Brockett was of the opinion that the utilities would be unable to secure as good treatment from a national bureau as from local public service commissions and legislatures where the local conditions and problems of utility companies would be given more consideration. It was admitted generally that the state regulations on the Pacific Coast were not uniform and not just or reasonable in all requirements and that the Safety Code was an improvement if the enforcement could be done intelligently and kept out of politics.

#### Merchandising.

A paper was presented, entitled, "Electrical Operating and Merchandising in Small Towns," by Louis A. McArthur and C. R. Young, of Portland and Spokane, respectively, with supplement by J. F. Farquhar. This paper cited the methods employed by the Pacific Power & Light Company and the Washington Water Power Company in conducting their light and power business in the many small towns in the states of Washington, Idaho and Oregon. Details of the operating, accounting and new-business methods employed are given.

Mr. Burtrand, of Grays Harbor, W. M. Hamilton, A. C. McMicken, of Portland, and others, discussed the paper on "Merchandising in Small Towns" and the general opinion was that the method of giving local managers sufficient authority to make adjustments and settle all service problems without the delay of referring to higher authority was very desirable.

#### Electric Range Report.

President Robinson secured the appointment of the Nominating Committee for next year's officers and then turned the meeting over to M. C. Osborn, of Portland, for a discussion of the electric range report. A rising vote was taken in appreciation of W. R. Putnam's work as chairman of the Range Committee. In Mr. Putnam's absence S. V. Walton, of San Francisco, presented the committee's report, which was only a supplementary one, stating that the original report of this committee which was presented at the National Electric Light Association convention in Chicago during May, 1916, was the work of the committee of the Northwest Electric Light & Power Association and that so little time had elapsed since the presentation of this report that it did not seem advisable to present any further data or information at this time. It was voted to accept the Range Committee's report which was presented at Chicago as a paper at this convention. Mr. Walton read the short supplementary report and S. M. Kennedy, of Los Angeles, was called on to discuss the merchandising of electric ranges. Mr. Kennedy stated that all of the reputable makes of ranges now on the market were about equally satisfactory and that no particular stress could be laid upon the superiority of any one range. Small burners, with the idea of economy in consumption, were not as satisfactory as the larger burners which gave quicker heating results. Electric ranges must be manufactured and sold cheaper in order to secure universal use. The preferential discount from manufacturers to jobbers, which has been proposed, whereby the central stations will not be able to buy ranges at as low a figure as the jobbers, was condemned, as it was believed that the central station would need all of the money possible in order to carry on the sales and demonstrating work for development of the business. The jobbers should wait until the business is more fully developed before they can undertake to make range selling a profitable line of work. Utility managers should send their engineers to conventions in order that they might get the maximum value from the experience of others in range service and selling. Separate salesmen for range selling and keeping in touch with the consumer's service after installation are of primary importance. Just as nobody now will have gas for lighting, even though it is cheaper than electricity, in the same way the near future will show a preference for electric cooking, according to Mr. Kennedy.

S. V. Walton, of the Pacific Gas & Electric Company, in discussing water heaters stated that in general a flat rate was found to be the best, although so far it was not as popular as had been expected. His company carries on tests continually, in the laboratory, of various types of heaters. Generally speaking, the best heater is one of small demand which runs continuously, keeping the water heated in the tank at all times. The installation, by his company, of 163 ranges and 66 water heaters, averaged $24.40 per installation as the cost of wiring and setting up, including water heater, $11.18 cost of meter installation, $17.00 cost of service installation, $34.50 cost of transformer installation and about $25 cost of sales expense on each range. The average monthly bill was $5.65, with three people in the family having range and water heater. His company's rates are four cents for the first 30 kilowatt-hours per kilowatt of demand, two cents for the next 90 kilowatt-hours and 1.5 cents for all over this amount.

J. F. Derge, of Salt Lake City, stated that the Utah company depends on its light and power salesmen to sell ranges and that 650 ranges had been sold to date. They found repeated canvasses of prospective customers secured the best results and that small houses were as apt to put in ranges as the larger ones. More ranges between $50 and $65 in price are sold than any other size.

A. C. McMicken, of Portland, stated that his company had an installation of 53 ranges in the Tudor Arms Apartments, which had been very satisfactory for over a year. The company demonstrator is furnished at the call of the apartment-house manager to instruct new tenants in the use of the electric range. The average monthly bill per apartment was $3.54 for both lighting and cooking. The company estimated $117 per range as the cost of transformers, services and meters, exclusive of interior wiring, and the sales cost at $55 per range, including setting up and service inspection. He opposed the preferential discount which it is proposed to give to jobbers.

H. J. Gille, of Seattle, read the advertising section of the committee's Chicago report and stated that the electric range was to be made a feature of the America's Electric Week by the Society for Electrical Development.

Mr. Osborn stated that the rates of utilities on the Coast are usually designed so that the first use of electricity for lighting during the month is covered by a higher rate and that a second rate for ensuing consumption was intended to apply to the range load. In this way the rate for range service amounted to approximately 3.5 cents in California, three cents in eastern Washington, two cents in Seattle and about 1.5 cents in Tacoma. He called attention to the fact, however, that more ranges are being sold in the higher-rate territory, by reason of more concentrated salesmanship. The type of hot-water heater having a double-throw switch for use when the range is not in service, will not supply enough hot water for a family of over three people. The Washington Water Power Company follows up range installations with home economists, so called, in preference to demonstrators, who are forbidden to offer anything for sale, in order to insure their welcome at all times. Extensive newspaper advertising was employed and the paper sent to non-subscribers who were prospective customers. College students are used during the summer as range salesmen. The installation of 112 ranges and one-third as many water heaters, cost on an average of $25.28 per range for sales expense alone, but it was estimated that between $60 and $75 per range was the total cost to sell, set up, and make service repairs. The rate of five cents for the first kilowatt-hours and three cents for all consumption in excess thereof brings about $4.15 per month revenue per range. This company has made a very large number of range installations since the first of this year and increased the revenue therefrom many times over.

A general discussion followed by Mr. Lemmon, Mr. Collins, of Tacoma, W. H. Fagan, of the Hughes Electric Heating Company and other manufacturing representatives, in which it was brought out that 90 per cent of the sales were of the higher priced ranges. Mr. Walton's company sells ranges at 25 per cent above cost, including the installation, and the easy-payment plan, with ten per cent off for cash. The main point was conceded to be the giving of proper follow-up service.

Mr. Kennedy stated that he had secured letters of commendation from 15 apartment house owners in Los Angeles where electric ranges were installed, but stated that the wiring of old apartment houses was very difficult and unsatisfactory. Mr. McMicken secured the passage of a resolution to be telegraphed to the license committee in New York condemning the proposed preferential discount to jobbers.

**Election of Officers.**

At the concluding session there was an address by Arthur H. Halloran on "A Greater Jovianism" and a paper by M. D. Cooper entitled, "Standardization."

The election of officers resulted as follows: President, M. C. Osborn, Spokane; vice-president for Washington, J. S. Thornton; vice-president for Oregon, C. J. Edwards; vice-president for Idaho, H. B. Waters; vice-president for Idaho, J. F. Roche; secretary, J. F. Farquhar.

## PACIFIC COAST CONVENTION OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

**Sessions at Seattle, September 5-9.**

The convention was called to order on September 5 at the Hotel Washington, by C. E. Magnusson, chairman of the Convention Committee. The address of welcome was made by Mayor H. C. Gill and responded to by H. J. Ryan. The meeting was then turned over to H. W. Buck, president of the Institute, and Ralph W. Pope, honorary secretary. Mr. Buck emphasized the tendency in the Institute policy to get away from the idea that the society is a New York institution, and said that every effort was being made to get the engineering minds together in different sections of the country to discuss their important problems.

**Distribution System for Domestic Power Service.**

The paper of the morning, "A Distribution System for Domestic Power Service from Commercial and Engineering Standpoints," by Carl H. Hoge and Edgar R. Perry, was then read by Mr. Perry. This paper was a discussion of the problems of service which would arise under a hypothetical condition, assumed by the writers, wherein a section of the better residence district in Seattle, approximately four blocks wide by eight blocks long, was assumed as being completely electrified, every house using electricity for lighting, cooking, hot-water heating and house heating. Very complete tables of connected load, actual demand, consumption and revenue were given, based on a large number of tests and indicating the load-factors and demand-factors which could be expected from various classes of residences, apartment houses, stores, etc., to be found in such a district. The existing rates of the Puget Sound Traction, Light & Power Company were cited. With these rates in effect it was shown that the total monthly bill would average from about $10.45 for the small one-story dwelling, to about $28.50 for a very large residence. From the total of 770 consumers in the district, a connected load of 17,367 kilowatts was anticipated, with a peak demand of 6,692 kilowatts and a daily load-factor of 29.4 per cent. The gross revenue from the business, as outlined, was computed at $153,220 per year, which would give an average return of nine mills per kilowatt-hour, or $22.90 per kilowatt-year. A distribution system was designed in outline to handle this service and estimated to cost $111,400, exclusive of substations, meters and service wires.

D. F. Henderson, of Spokane, opened the discussion by

stating that in the more severe winter climate there, his experience indicated that the kilowatt-hour consumption for heating purposes was much greater than the figures given in the paper.

J. B. Fisken, of Spokane, stated that his company had taken care of the increased load due to this business by converting its six-conductor cables formerly used for three single-phase feeders into three-phase feeders, thereby making better utilization of the copper. He also called attention to the advantages of interconnecting secondary systems with sectionalizing fuses in order to get the best advantage of the diversity-factor and maximum use of transformer capacity.

M. T. Crawford, of Seattle, recommended star-connecting the 2,200-volt primary system and installing individual transformers in small manholes adjacent to the basement wall of each dwelling with very small service wires of duplex cable in iron pipe to the nearest pole, thereby eliminating the excessive amount of copper in the distribution system. Although the total cost of this method would be greater, it would be more susceptible of installation one unit at a time, as the business was secured.

J. R. King, of Seattle, stated that the great preponderance of energy used for heating under these conditions would shift the hour of peak load, so that the present off-peak hours need not be given consideration.

Others who discussed the paper were C. R. Collins, W. D. Peaslee, F. D. Weber, E. G. Robinson, L. T. Merwin, H. W. Buck, H. J. Gille, Robert Howes.

**Domestic Electric Cooking and Heating.**

At the afternoon session a paper entitled "Some Features of Domestic Electric Cooking and Heating," by H. B. Peirce, was presented in his absence by D. F. Henderson. This paper appeared in the last issue.

This paper was discussed by Messrs. Fisken, Magnusson, Peaslee, Curtis, Pope, Perry, Holland and Gille, and it was brought out that the electric heating of buildings mentioned only briefly in the paper, was somewhat of a question as to the future, as it is something which may be practicable in one community and not in another. The tremendous peak for a short time of the year for this class of load would be a very serious problem to central stations. Some very simple form of building heaters were described, one by C. E. Magnusson, being simply an iron pipe with a copper layer sweated close to the outside thereof forming the secondary coil and surrounded by a primary coil connected to the electric circuit. This arrangement gave an induction-type heater which could be inserted in the ordinary radiators of hot-water heating systems. It would operate at a power-factor of about 98.5 per cent and the unit suitable for one radiator requires about 1.5 kilowatts.

**Temperature Rise of Cables.**

A paper entitled "Temperature Rise of Insulated Lead-Covered Cables," by Richard C. Powell, was read by E. A. Loew. After a brief historical note the factors that determine the rating of a cable were considered. The thermal conductivity of a cable was expressed in terms of the volume thermal conductivity of the insulation, the surface thermal conductivity of the lead sheath, and the dimensions of the cable. The values of the thermal conductivities as given by various observers, including the author, were compared. A diagram was shown for readily obtaining the thermal conductivities of one-conductor cables, and tables were given of the carrying capacity of one-conductor cables for various duct temperatures and thicknesses of insulation. Factors were added so that the carrying capacity of multiple-conductor cables may be taken from these tables. Sometimes the lead sheath of a cable carries considerable stray current. A formula was given for calculating the increased temperature due to such current. The carrying capacity of a cable is largely determined by the thermal properties of the duct line in which it is installed. This feature was discussed briefly. The overload or intermittent rating was calculated from a formula involving the thermal capacity of the cable multiplied by a factor. Experimental values of this factor for several types of cable were given. A formula was given to take account of variable air temperature.

A general discussion followed by Messrs. Merwin, Crawford, Fisken, Lindsay, Collins and others. One point brought out was the necessity for taking into consideration the presence of steam-heating mains in the vicinity of duct lines carrying cable and one instance in Portland was cited where high-water conditions put the steam main under water level and the insulation on the piping was rendered useless. The surrounding soil and water were then raised to a temperature of over 220 degrees Fahrenheit and the electric duct line nearby subjected to this temperature. The cables were only saved by forcing water from pumps through the ducts along the cables on the electric lines and cooling them thereby. It was the general practice to ground the lead sheaths of all cables together and to the negative bus of the street-railway system. President Buck cited an experience at Niagara Falls where large single-conductor, lead-covered cables were used and where very serious trouble arose due to the large amount of current induced thereby in the lead sheath, which pointed to the desirability of building multi-conductor cables on alternating circuits. It was suggested that the placing of exploring coils in the center of duct lines midway between manholes would be very useful in determining such inaccessible locations.

At the session on Wednesday morning President Buck made an address, commenting on the rapid growth and progress of the Pacific Coast. The engineer should have an important place in society, as his work has caused most of the differences between this country 100 years ago and today. The insulation of our systems is probably the most serious question before us today and a new design of line insulator is badly needed. The European War has brought to the front the importance of the engineer and the appointment of our Naval Consulting Board indicates the recognition of his usefulness.

**Induction Interference.**

A paper entitled "Induction Interference as a Practical Problem," by R. H. Griswold and R. W. Mastick, was then presented by Mr. Mastick.

Frederick Bedell, of Cornell University, opened the discussion, stating that the improvement of wave form was one of the remedial measures which would accomplish the most good in this problem. Messrs. Merwin, Ficken, Peaslee, Robinson, Corbett and Whipple participated in the discussion, asking the author in regard to other remedial measures and if the telephone companies had given them trials. Mr. Fisken approved of the recommendation to install neutral grounds only at the power stations and important switching stations. Mr. Mastick replied, appreciating the advance in co-operation in the policy of power companies with the telephone engineers of recent years. He stated the telephone engineers had tried the Thompson system of telephone loading with inductive shunts, and also tried the use of series impedances for producing a straight-line function of the Pupin type of loading, through the range of voice frequencies. Neither of these propositions were found efficient, as any scheme which would filter out the objectionable frequencies would necessarily impose a transmission loss on the telephone circuits. This cannot be permitted, as the whole tendency of telephone service is toward longer range of transmission. Inductive interference from flat construction on pole tops is harder to eliminate than from triangular arrangement.

### Testing for Defective Insulators.

At the session on Wednesday afternoon B. G. Flaherty presented his paper entitled "Testing for Defective Insulators on High-Tension Transmission Lines." This paper described the three methods of testing insulators; with oscillating transformers, with megger and with telephone receivers. The latter method, which was brought out two years ago in a paper by M. T. Crawford, was made the subject of detailed treatment and data on laboratory checks of field tests were given. The cost of making field tests on insulators while in service is given at 2.3 cents per insulator and the labor cost of locating and replacing defective units at $1.13 each. The method is simply the shunting of a portion of the path of the capacity current from the insulator to the ground along the pole by a circuit containing a telephone receiver, and detecting the defective insulators by the variations in sound in the receiver. Many data were given on rate of depreciation of pin-type insulators.

In the discussion Mr. Merwin brought out the value of an audion amplifier in the telephone circuit and stated that with it he had been able to drive along near a transmission line and tell when he came to a pole having a defective insulator. The question was raised as to why insulators found partially defective were left on the line and watched until they became bad enough to require replacing, and it was brought out that a big economy was effected thereby, the cost of replacing all insulators not up to the standard of new units being prohibitive. H. J. Ryan stated that the porosity and lack of uniformity in porcelain ware made it a very poor substance for insulation under severe conditions, and predicted that some form of quartz or flint insulators would be developed. Quartz will endure electrical stresses admirably and is tough and refractory, besides having nearly zero temperature co-efficient. Mr. Pope stated that back in 1858 the Boston and Albany line was fitted with white flint insulators, which were superseded by glass on account of cheapness. Dr. Ryan stated that some of the insulators made years ago are better than those of today.

### The High-Voltage Potentiometer.

Dr. Ryan then presented his paper entitled "The High-Voltage Potentiometer," describing a device for investigations where errors of 2 to 3 per cent were permissible, which could be made at reasonable expense. It consisted of a column of water moving slowly through an ample length of garden hose forming a water resistance. Tapping in points through which to connect a probe detector are provided by breaking the hose at regular intervals and connecting it together again with the metal "hose menders" on the market. The chain of equal water resistances formed thereby is connected across the same high-potential source as the insulator or specimen under test, and by probing with a detector between the desired point in the test specimen and the tapping-in points along the water column, a tapping-in point may be found which corresponds in its position in the potential gradient. In this way the potential at various points along a string of disk insulators or other test specimen may be explored.

C. E. Magnusson then read the paper written by S. R. Burbank and himself, entitled "An Artificial Transmission Line With Adjustable Line Constants." This was a description of a line built in the laboratories of the University of Washington which can be readily adjusted to represent 200 miles of commercial transmission lines of any spacing up to 10 feet and any size wire up to 4/0 copper, and also to telephone or power cables. The discussion by Messrs. Ryan, Fisken, Corbett, Peaslee, Ross, Burbank and others, indicated that such an artificial line could also be applied to very useful purposes by power companies in investigating difficulties in operation on their own lines.

### Characteristics of Admittance Type of Wave-Form Standards.

At the session on Friday morning a paper entitled "Characteristics of Admittance Type of Wave-Form Standard," by Frederick Bedell, was read by him. A sine wave of electromotive force at generator terminals and on transmission lines was conceded to be very desirable and the Standardization Rules of the Institute specify such as standard. The present methods for prescribing allowable limits and for determining how near an actual wave is to a true sine wave are very unsatisfactory. Complete characteristics of a certain type of standard with formulas for distortion-factors were set forth and discussed in detail. Lengthy written discussions were presented by engineers of the telephone companies and of the electrical manufacturing companies, which lack of time did not permit of consideration at the meeting. Messrs. Merwin, Corbett, Fisken, Peaslee, Ryan and others discussed this paper, principally from a point of the use of this standard in detecting harmonics which are objectionable to telephone companies. The numerical exactness of the standard was not considered as much as its practical application. It was seriously doubted if the rates which utilities are permitted to charge for electric service would permit the replacing of existing generators and equipment with much more expensive units which might be made to give a sine wave, and it was the opinion that the telephone companies should devise methods of damping out the objectionable harmonics.

### Insulator Failures.

A paper entitled "Insulator Failures Under Transient Voltages," was presented by W. D. Peaslee. The operation of a high-voltage transmission line involves changes in energy distribution that are very conducive to high-frequency disturbances and transients of very steep front. These are often superposed on the normal voltage of the line in such a way as to impose great stresses on the insulators. The mechanism of failure of an insulator is of great importance to those designing and operating transmission lines. This paper presented the results of recent investigations on the failure of insulators under impact and combined impact and normal-frequency voltages. Microphotographs of the resulting failures were included. The breakdown of a dielectric involves energy, which is a time function, and the importance of the duration of the stress in determining the magnitude of the voltage necessary to puncture an insulator is discussed. Due to the short duration of transients, insulators are often punctured repeatedly by them, the porcelain in the puncture solidifying again on account of the small energy involved. These sealed punctures, however, weaken the insulator, lowering its dielectric strength materially. The importance of the elimination of air holes and defects in the porcelain were shown. Some essential features of a successful line insulator were stated.

A discussion followed by Messrs. Fisken, Howes, Merwin, Mastick, Ryan and others in which the presence of harmful transients in circuits controlled by air-break switches was doubted by some of the operating men, but the burden of evidence seemed to be that under some conditions the harmful transients would be induced. The importance of installing lightning arresters within a few yards of the station equipment was emphasized. Dr. Ryan stated that porcelain in the mass raised to 450 degrees centigrade is a conductor of the same order as carbon and that the variation of the formula for porcelain had very little to do with the puncture voltage. It was indicated from the discussion that many insulators are probably punctured only a portion of the way through their entire thickness by the impact of steep wave fronts on some transients and that at a later date a repetition of the same impact of lessor severity may cause a puncture.

## PENNSYLVANIA ELECTRIC CONVENTION.

**Ninth Annual Meeting at Eaglesmere, Pa., September 5 to 8, Is Most Successful in History of Association.**

With a record attendance of 385, including representatives from practically every important operating company in the state, the ninth annual convention of the Pennsylvania Electric Association was held at Eaglesmere, Pa., September 5 to 8, inclusive. A most interesting program coupled with very pleasant entertainment features and almost ideal weather conditions combined to make the meeting one of complete enjoyment and practical value.

The convention was fortunate in securing the presence of W. D. Ainey, chairman; A. B. Miller, secretary, and George P. Wilson, chief of the Bureau of Rates and Tariff, all of the Pennsylvania Public Service Commission.

W. K. Kerford, of Philadelphia, established a high standard of excellence in the provisions made for entertainment, ably assisted by C. L. Pierce, Jr., of Pittsburgh.

The manufacturing companies contributed their full share to the success of the convention by many exhibits, the offering of 75 prizes for the various sports and the publication of a daily four-page newspaper edited by J. C. McQuiston, of Pittsburgh,

The business sessions of the convention opened on Wednesday morning with President Stephen C. Pohe, of Bloomsburg, in the chair. In his opening address, Mr. Pohe commented briefly on the events of the past year in Association work and made the significant statement that the Pennsylvania Electric Association is the largest Geographical Section of the National Electric Light Association, including, as it does, 98 per cent of the companies operating in the state, comprising a total of 1,835 members, a gain of 212 during the past year. He bespoke the continued co-operation between members and the Association for fair regulation and equitable laws governing public utilities.

Reports of various minor committees were next presented by their respective chairmen. In presenting the report of the Exhibition Committee, C. L. Pierce, Jr., of Pittsburgh, strongly urged that a single location be decided upon for all future conventions in order that a more comprehensive and permanent exhibit may be given. For the Committee on Safety and Welfare, B. F. Day, of Philadelphia, in a short report, recommended the adoption of vocational training and the acquisition of technical graduates for use in the more complicated and involved activities of central-station companies. It was also strongly urged that complete and careful records of all operations under the recently enacted Workmen's Compensation Act be made and preserved for the future use of the membership at large. H. R. Kern, of Philadelphia, for the Accounting Committee, presented its third report to the Association on a proposed classification of accounts for electric utilities. The committee submits for adoption a system of accounts designed to meet present conditions in Pennsylvania. Minor revisions only have been made of previous reports submitted to the Association. In principle and largely in arrangement the classification recommended is in substantial agreement with the standard classification of the National Electric Light Association and those systems adopted and put into effect by the public service commissions in the various states. Considerable variation in practice in accounting procedure has been much in evidence in the past, and it is of increasing importance that accounting methods be unified to the greatest possible extent.

F. Heinbokel, Warren, then presented a paper on "Construction of Cost Accounting."

The author discussed methods of accounting in detail, of combining charges to capital accounts, together with the detail cost of any particular job, which is essential for both accountant and construction engineer. The question of installing a system of separate work orders for each job should be seriously considered by every utility and every company should install a cost system commensurate with its needs. Forms of requisitions, time reports, etc., were used to illustrate many of the points brought out in the paper.

In a paper on the "Classification of Materials and Supplies," W. P. McArdle, of Pittsburgh, called attention to the rapid increase in the amount and variety of stock which the development of the business, both as to volume and diversity, requires the central station to maintain, and the consequent necessity for more complete and comprehensive classification and stock records. The classification of materials and the forms and subsidiary records required to maintain a complete system, together with a description of the methods used and the reports considered desirable, were fully covered. With the classification system of control, inventories, if desired, may be made of one or more classes each month, without disturbing, to any great extent, the regular order of business.

### Securing Small Customer Business.

The Thursday morning session opened with a paper on "Methods of Securing Consumers Deterred by First Cost of Wiring," by E. C. Newman, of Pittsburgh. This paper pointed out the necessity of the adoption of systematic methods to secure the residential business, particularly of the older buildings not now wired. It further reviewed, in detail, the more succesful plans adopted by various companies, such as the deferred-payment plan, limited time offers, reduced cost for wiring, etc., and also elaborated on the necessity for advertising and expert salesmanship. The reason for success or failure of some of these plans was discussed and suggestions made as to the conduct of campaigns of this character.

S. E. Wendle, Williamsport, found no success in deferred payments. Inasmuch as it is almost impossible for the landlord to receive a return for his investment, it is most difficult to persuade the owner of houses renting at from $10 to $12 per month to wire the property. In selling appliances, he has experienced much success with limited time offers and in the plan of giving a certain amount of free current for introducing new appliances, such as ranges. The first cost, however, should include most of this value to protect the central station for the current so given. Rental of appliances, he said, is a losing proposition. A good plan to keep in touch with all prospective business is to closely follow the issuance of building permits and all other similar leads.

H. H. Ganser, Norristown, expressed the opinion that the minimum charge does not deter people from using current. It is their practice to forward annual statements to the consumers showing in just what months the minimum was not used and advising the purchase of appliances for use at those times.

E. F. McCabe, Titusville, has tried the installation of excess meters, but on account of their abuse in connection with appliances, has limited such devices to illuminating purposes. The cost of wiring is divided between the owner and tenant where necessary and all new consumers are given an iron gratis. A discount is allowed for prompt settlement of deferred payments.

In Harrisburg, C. M. Kaltwasser, said 1,200 consumers had been signed up in a period of three months by offering the free installation of four outlets with a charge for all concealed work and additional outlets. The contractors co-operating made a profit on fixtures sold and on the added outlets, while it cost the central-station company

an average of $6.81 per consumer. A further acquisition of 1,800 consumers is expected to be gained by this plan within the next four months.

C. S. Long, Cottsville, effects an arrangement whereby the tenant pays $1 per month additional rent in return for the expenditure made for a wiring system by the owner. In summing up the discussion on his paper, the author estimated that 95 per cent of deferred payments are met in full. In answer to a question, he made the rather paradoxical statement that while he was unable to truthfully say that the new-business department is conducted at a loss, yet it is not self-sustaining.

**Construction Records.**

In a very forceful paper on "Construction Records and Accounts," H. C. Hopson dealt especially with the correct methods of accounting. Particular emphasis was laid on the following points: The fundamental principles underlying the assignment of items to accounts, with the especial importance of credit items; the results of three groups of inventory accounts, as related to the capital account; elements of cost with their proper classification; how to handle "inherited property accounts;" proper methods of accounting, pertaining especially to the smaller companies.

This paper together with the report of the Accounting Committee and the previously presented papers of Messrs. Heinbokel and McArdle were discussed collectively.

Mr. Rieber, Johnstown, and H. H. Ganser, Norristown, advocated the actual adoption of a uniform system of accounting as soon as possible, including a job order or project system. Proper accounting aids materially in the work of the manager and the new-business department. In answer to questions propounded by E. D. Dreyfuss, Pittsburgh, and L. H. Conklin, Scranton, Mr. Hopson said that the capital account could be safeguarded in the case of improvements in property only by crediting the old material and charging out the new. There are a few isolated exceptions, however, where different methods must be used. It is very important also to identify work or material by location, manufacturer's number or other similiar notation. A very good method of checking the details of new construction work is to have the auditor regularly inspect such improvements so as to become familiar with its components. Emphasis was laid on the fact that action of regulating tribunals can be anticipated by the adoption of standard methods of accounting.

A very interesting address on "Rate Research," was given by W. J. Norton, Chicago, a member of the Rate Research Committee of the N. E. L. A. The practice of most companies in reducing their maximum rates rather than the average rates was pointed out to be wrong in principle. Lantern slides were shown illustrating the variation throughout the country of maximum, average and net rates and minimum charges. The manner in which the coming N. E. L. A. rate compilation will be handled was also shown.

**Factors in Underground Distribution.**

At the Friday morning session, H. N. Muller and W. F. Keating, Pittsburgh, made some informal remarks relative to the "Factors in Underground Distribution," which paper was not completed in time for publication. Stress was laid on the dangers of blind sentiment on the part of the public for removing overhead wires. The leading spirits in these movements must be shown that not only will each consumer be compelled to expend money to change their wiring systems, but that increased rates must pay for underground wires.

H. R. Smith, Philadelphia, suggested that central-station employees whose duties bring them in contact with the public should be kept well posted on the facts and figures of this proposition so as to be able to intelligently answer the numerous questions propounded by the man on the street.

In answer to a query as to the best type of underground construction, Mr. Muller said that local conditions and requirements govern this point to a large extent.

Upon being asked to favor the meeting with a few remarks, W. D. Ainey, chairman of the Pennsylvania Public Service Commission said that the Association is a great factor in facilitating the work of both members and Commission and that the secret of harmonious relations depends upon the appreciation by the public, the Commission and the utilities of each other's motives and purposes.

**Electric Ranges.**

The next paper on the subject of the "Increased Use of Electric Ranges and Small Appliances in the Home," by H. W. Reed, Altoona, attracted a great amount of interest and discussion.

The subject treated in this paper showed how it may be profitable for central stations to sell at cost or less than cost small appliances, thereby increasing the yearly revenue; the problems of the electric range and water heaters as utilities were taken up and solutions offered for them; and best methods of advertising and exploiting all appliances were discussed in detail. These appliances must be of good quality in order that when advertising them, the name of the manufacturer back of them can be given. This not only gives the salesman confidence in the article he is selling, but creates a feeling of confidence in the purchaser, who invariably prefers to buy goods on which is registered a nationally known trade-mark. Good appliances, together with intelligent demonstration and with that all-important commodity of good service, will go far to assist the customer in realizing that the "Home Electric" has at last arrived.

Mr. Osborne pointed out that ranges should first be sold and used in the wealthier class of homes and apartments, and, instead of being sold on trial, make the price at cost and charge a certain amount for installation. The critical period in the customer's attitude toward the electric range is during the first two weeks and very frequent visits by the demonstrator should be made to insure efficient operation. Mr. Blair stated that when an electric range is installed, the coal range should be sure to be removed. Mr. F. M. Noecker, Renora, asked for a greater amount of co-operation between the manufacturer and the central station and as a necessary result, a lower first cost of ranges. One member company has sold 40 ranges to the middle class of families with a resulting average monthly consumption of $2.82. The solution arrived at for the hot-water problem was the coal heater, since it was found that the electric water heater is beyond the reach of any but the wealthy. In reply to a statement that electric cooking offers no economic argument as compared to dollar gas, Mr. Reed said that ranges had been sold in Altoona on a saving-in-cost basis in competition with 35-cent gas.

It was recommended that a committee on Electric Ranges be appointed to collate and co-ordinate facts, figures and methods on this subject for the use of member companies.

"The Testing of Current and Potential Transformers" was then taken up by W. A. Fogler, Philadelphia.

H. H. Wilson, Harrisburg, then presented a paper on "Boiler Room Operation," which treated the subject in a somewhat general manner and presented a study of the methods to be pursued in the operation of a boiler room.

The operating details of the paper were discussed by Messrs. Hobbs, Bell and Wendle. In this connection, it

was shown that it is very important to provide adequate safety devices for the protection of power-plant employees together with good washroom facilities and other sanitary measures.

J. F. Martin and H. N. Muller, Pittsburgh, presented a very original and interesting paper on "Hiring and Placing Men Under Standardized Working Conditions."

On account of the pressure of time, no discussion developed on this subject. Several resolutions were presented and the Nominating Committee announced the choices for officers during the ensuing year. The following were elected:

President, George B. Tripp, Harrisburg.

First vice-president, H. N. Muller, Pittsburgh.

Second vice-president, E. H. Davis, Williamsport.

Treasurer, W. R. Kenney, Connellsville.

Executive Committee, John S. Wise, Hazleton; A. H. S. Cantlin, Allentown; Henry Harris, Pittsburgh; W. E. Long, Philadelphia, and Warren Partridge, Clearfield.

## The Safety Code and the National Electric Light Association.

The opposition expressed by representatives of the National Electric Light Association to the promulgation of the final draft of the National Electrical Safey Code, issued by the Bureau of Standards, has led to the interchange of correspondence on the subject between H. A. Wagner, president of the N. E. L. A., and E. B. Rosa, chief physicist of the Bureau. This opposition appeared at the final conference on the subject, held in Chicago, May 29 and 30, and reported in the issue of June 3.

In a letter dated August 5 Mr. Wagner says in part:

"The proposed National Electrical Safety Code has been prepared, discussed and revised by the Bureau of Standards with the fullest co-operation of the engineers of many of the public utilities and other interests concerned in the transmission and distribution of electricity. It has been frankly admitted by many of these engineers that, as a set of engineering specifications and rules to establish standards for a high class of electrical installation, the Code is more comprehensive and complete than any set of rules so far advanced. It is frankly anticipated that there might be many situations where the rules could not and should not apply, and where any attempt to enforce the rules might work great hardship and damage both to a public service utility and that part of the public using its service.

"It is, therefore, respectfully suggested and strongly urged that the rules of the Bureau, when promulgated, should be accompanied with a distinct statement to the effect in substance that they are not claimed to be of universal application, but are rather a standard of practice, to which all companies should approach as nearly and as rapidly as practicable, and that the failure in any given case, fully and literally to comply with all their requirements, is not to be taken as evidence of bad practice, without consideration of the special circumstances and conditions in the particular case in question.

"It should be evident that the preparation and codification of the rules was largely an engineering problem, which could be and was frankly discussed by the engineers of utilities, but, that, on the other hand, the adoption and use of the rules would become a matter of public policy which the engineers were not authorized and did not make any material attempt to consider.

"Up to the time of the general conference of the Bureau in Chicago, on May 29 and 30 last, the conferences had been devoted principally to the engineering aspects of the Code, and with some qualifications and exceptions the engineers of the utilities and the Bureau were fairly in accord as to the general character and scope of the rules, although not agreeing with certain specific items. When, however, the general conference was called the Bureau asked for an expression 'on the general adequacy and practicability of the Code, and on its readiness for introduction on trial,' thereby changing the issue from one of electrical engineering to one of public policy.

"As I understand and interpret the criticisms of the members of the Committee of the National Electric Light Association, made at the general conference, these were directed particularly to the question of the Code's readiness for introduction on trial, and as to what the proposed introduction and trial might involve and the possible injustice which such trial might work upon many utilities, particularly when the interpretation and application of the rules should get beyond the control of the Bureau, as they necessarily would. This involved the question of public policy and intervention in local situations and issues which no committee of the National Electric Light Association is empowered in any way to commit and give the assent of its membership to.

"The Committee went to the general conference at Chicago with the full understanding that they could neither approve nor endorse the Code for the Association. The situation was such that while practically all the electrical utilities are in sympathy with regulation within its legitimate scope, it was the belief of many that the enforcement of this Code would go further than regulation and seriously invade the field of operation. To take out of the hands of the officials of the utility companies questions of management might deprive the public and investors of the benefits of private initiative and official responsibility upon which they have a right to and do insist.

"The Bureau's suggestion that these rules might receive tentative adoption for trial by states and municipalities might not, and probably would not be carried out in the same spirit and with the same broadminded attitude which the Bureau holds. When the rules are once printed and sent out broadcast they will be entirely out of your hands, and, yet, bearing the imprint of the Bureau of Standards, Department of Commerce, they will have great weight and authority.

"While our Committee frankly gave your organization credit for the immense amount of conscientious work in the production of an unusually complete set of specifications covering construction and operation of electric installations they took the stand that the owners of electric utilities in the last analyses must be the ones to decide whether or not they could, in actual practice, live under the proposed rules. I am sorry, however, that the Committee took the attitude of emphatically stating its *disapproval* of the Code, in seeking to show that it could not *approve* of a proposed use of the Code which would necessarily result in the loss by the Bureau of any power whatever to control its interpretation and application."

In his reply to this letter Dr. Rosa said:

"Regarding the matter of making it clear that the rules are not intended to be universally applicable in all particulars, nor to be rigidly enforced at once, we feel that our introductory statement, together with the plan and scope of the rules, as given at the beginning of each of the four parts, and the rules themselves, make that very clear indeed.

"We feel that undue stress has been laid upon the possibility that public service commissions and other public authorities will not administer the Code in an intelligent and reasonable way. The engineers of the Bureau of Standards have discussed this matter with a good many commissions, and we have not found a single commission that has shown the slightest disposition to interpret the Code in an unreasonable manner, or to ignore general practice or the interpretation of other commissions, or the explanations of interpretation of the Bureau of Standards. Of course, particular instances of unfair requirements will arise, but utility companies know what to do in such cases. Regulation of public utilities would be impossible if it had to be shown in advance that no commission or engineer of a commission or other administrative body would ever make a mistake.

"It is proposed to adopt the Code for use *on trial*, in order to develop and perfect it by the experimental method.

"You speak of the committee's anxiety concerning 'the possible injustice which such trial might work upon many utilities.' The purpose of a trial use is: (1) To permit utilities and others concerned, as well as administrators to become familiar with the Code. (2) To demonstrate its usefulness and practicability. (3) To ascertain whether the utilities find it a hardship to comply with any of the rules and if so, to remove the difficulty. But it certainly is not intended that companies will be obliged to comply with the rules strictly before ascertaining whether they can do so reasonably. No company could put such a code into effect completely at once. It will take many weeks, and in some cases months to become entirely familiar with all phases of the Code and consider what must be done to meet the letter and spirit of the rules. If a company does first the things that are most obvious and most readily done, and gradually takes up the more difficult questions, it will be prepared sooner or later to report to a state commission or other administrative body in what respects it cannot reasonably comply with the Code. The *trial* is to find out such things, in order that the Code may be revised and made entirely free from unreasonable requirements, if it contains any now."

## Preliminary Plans for America's Electrical Week Announced in Several Cities.

Plans are under way in Dayton, O., to join in the week's celebration, from December 2 to 9, under the auspices of the Society for Electrical Development, and it is believed that an excellent display can be held, in view of the activity of electrical interests in the city and its several large manufacturers of electrical goods. J. M. Wakeman, general manager of the Society for Electrical Development, is to be in Dayton on October 23 to assist in interesting business men in the plans.

Louisville (Ky.) Jovians, through their committee, of which Frank H. Miller, superintendent of motive power of the Louisville Railway Company, is chairman, have commenced preparations for the celebration of America's Electrical Week. Work in the direction of preparation during the hot months has been largely under cover, although the prospective exhibitors have been approached, and know by now what is expected of them. The committee will meet September 19, after which work in preparation for the demonstration will go right ahead. The Jefferson County Armory has been leased for the use of the electrical fraternity, and at this time all appearances promise a successful exhibition.

Preliminary plans are being made in Denver, Colo., for a celebration during America's Electrical Week. It is planned to hold a parade of all available electric-driven vehicles as one of the many events. Extensive exhibits will show the benefits of electricity in the home, upon the farm and in the factory and store. Downtown streets will be elaborately decorated and illuminated. Fraternal and civic organizations will take part in the celebration. Business firms will be asked to decorate their stores, and the city will be dressed in gala attire in honor of the occasion.

The men that have been selected to form the committee of arrangement for the electrical celebration are W. J. Barker, vice-president of the Denver Gas & Electric Light Company; R. A. Lewis, of the General Electric Company; W. C. Sterne, of the Summit County Power Company; C. N. Stannard, secretary of the Denver Gas & Electric Light Company; Alexander Brown, Denver manager of the Western Electric Company, and a number of other prominent men in the electrical industry.

## Handbook for Range Salesmen Issued by Society for Electrical Development.

"How to Sell an Idea" is the title of a very interesting handbook on electric cooking just published by the Society for Electrical Development. It is intended for electric range salesmen and those contemplating range campaigns.

There is nothing dry about it. From beginning to end the little 32-page booklet is full of snap and not only contains a summary of good concrete ideas for selling electric ranges, but it is well worth reading for the very human angle it takes. So far as known it is the only booklet of its kind that has been published.

The move for the publication of the handbook started with a meeting of electric-range manufacturers at the offices of the Society for Electrical Development. Next a meeting was held at the Executive Offices participated in by representatives of all interests.

At the June 1916 convention of the National Electric Light Association, important electric range sales managers of all interests met with the Society's staff, and it was decided at that meeting that the Society was the logical organization to issue a booklet giving the salient features for selling electric ranges.

For members, the booklet has more than ordinary value, for it carries with it the special services of the rate and engineering department of the Society. It is said the Society has the most complete file of electric cooking rates in existence. The rate cards also contain information in regard to costs of other forms of fuel.

A surprising fact developed recently in analyzing rates for electric cooking of 5 cents and under in 3,300 communities. It was found that, contrary to the general impression, 1,884 communities in the eastern part of the country have cooking rates as against 1,260 in the western part. In other words 624 more eastern communities have a 5-cent or less cooking rate than in the far west where hydroelectric power is so well developed.

The Society will soon have ready for distribution another booklet on electric cooking, this one for the public. It sells electric ranges from a new angle—just as the Society has done in its new salesmen's booklet "How to Sell an Idea."

## Texas Power & Light Company Plans Extensive Improvements.

The Texas Power & Light Company, of Dallas, Tex., has connected its transmission line that leads to Paris with that which extends out of Waco. This places in one system more than 300 miles of power line, including electric plants at Paris, Bonhan, McKinney, Denison, Waco, Temple, Taylor and the plant of the Fort Worth Power & Light Company at Fort Worth.

Shortly before the war outbreak in Europe the company entered into a contract with the city of Denison by which it took over the lighting and power privileges in the town and agreed to construct and have completed by December 31, 1916, a new station, to be situated on Red River, near Denison, at a cost of not less than $400,000. The company gave bond to the city in the sum of $25,000 as a guaranty that it would carry out the agreement to build a new power station. It is now announced that on account of the bad condition of the money market the company will be unable to construct the power plant within the agreed time. It will ask the City Council to enter into a new contract whereby it shall be stipulated that a power station to cost from $750,000 to $1,000,000 shall be erected on the Red River within three years. The company is willing to enter into a new bond of $75,000 that it will fulfill the proposed amended or new contract.

The Texas Power & Light Company has under consideration and well advanced toward consummation plans for enlarging its electric power transmission system in different parts of Texas. It is tentatively decided to construct a large power generating station at Austin for the purpose of affording power for an extension of its transmission line to that city and thence to San Antonio. The Southern Traction Company, with which the Texas Power & Light Company is closely allied, will extend its interurban electric line from Waco south to San Antonio via Austin in the not far distant future, it is stated, and the proposed Austin power station will furnish power for operating the new division.

## Committee Heads for New England Convention.

The following have been appointed chairmen of the committees which have in charge the annual convention of the New England Section, National Electric Light Association, to be held at Pittsfield, Mass., October 17 to 20: Transportation, S. J. Lent; Discussion of Papers, on Power Day, A. B. Lisle, Providence, R. I.; at Accounting Session, Bowen Tufts, Boston; at Commercial Session, C. R. Hayes, Fitchburg, Mass.; at Public Policy Session, R. W. Rollins, Worcester, Mass.; Reception Committee, W. A. Blackford, Boston; Golf, F. C. Sargent, Boston; Tennis, H. A. Gidney, Boston; Sightseeing Trips, W. A. Whittlesey, Pittsfield; Hospitality, Bowen Tufts, Boston. The latter is a new committee to promote acquaintance.

# Desirable Characteristics of Mill Drives

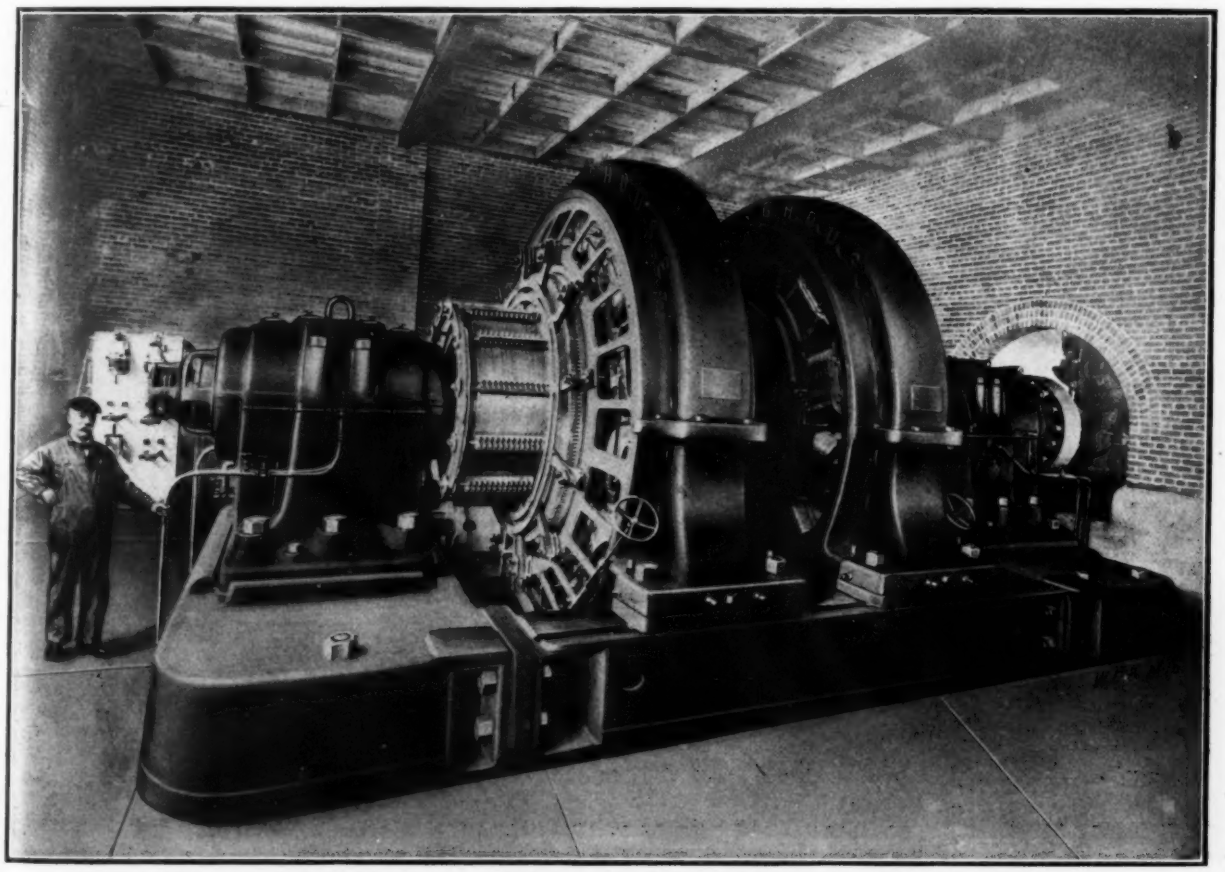
## Comments Relative to the Installation, Adaptability, Operation and Comparative Costs of Large Electric Motors for Driving Roll Trains

By R. Tschentscher
Electrical Engineer, Illinois Steel Company

ABOUT ten years ago the first large electric motor drive applied to roll trains in the steel industry was installed in this country. This consisted of two direct-current, 250-volt, 1,500-horsepower motors at the Edgar Thompson Works of the Carnegie Steel Company, driving a light-rail mill. This installation was followed within one year by an outfit for a similar purpose at the South Works of the Illinois Steel Company. In this case the equipment consisted of two 2,200-volt, three-phase, 25-cycle, cascade, 1,200-1,800-horsepower motors, which were the first alternating-current motors of considerable size used in driving roll trains. At the same time the first electrically driven reversing mill in this country was installed at the South Works of the Illinois Steel Company. This equipment consisted of a 1,300-horsepower, 2,200-volt, three-phase, 25-cycle—2,500-kilowatt, 575-volt, direct-current motor-generator set, operating at 375 revolutions per minute, supplying power to two 2,000-horsepower motors on one shaft, direct-coupled to a reversing 30-inch Universal plate mill. This drive was the result of a small experimental layout first operated in December, 1905. It was designed without any knowledge of the situation in connection with reversing mill drives abroad, where one large reversing drive was in operation a few months before the first commercial one in this country.

Financial conditions in 1907 and 1908 prevented the installation of additional electric-motor roll drives. The situation became active again with the well known installation at the Gary Works of the Illinois Steel Company. Rapid progress was then made in miscellaneous installations at various points in this country. Such installations were practically all of one class, namely, constant-direction drives. The reversing drive was given a wide berth, and with but two exceptions, installations of this character were avoided in this country until within the past two years. Abroad, however, notably in Germany, a considerable number of reversing drives were placed in operation during the idle period in this country.

The total number of electric drives for roll trains in service and contracted for has ceased to be a subject for tabulation. The number of large constant-direction drives no doubt exceeds 100, and the reversing drives over 25. The experimental period may surely be considered as passed, and the factors which stand out as requiring first consideration ought, it appears, to be well established. When laying out and deciding upon an installation for a rolling mill, it is usual to assign to the mill a certain number to indicate its size, which number refers frequently either to the diameter of the rolls or to the width of the same. Also the tonnage capacity is indicated as a certain figure per month on the basis of 52 twelve-hour turns. Care must be exercised that this figure is not given too

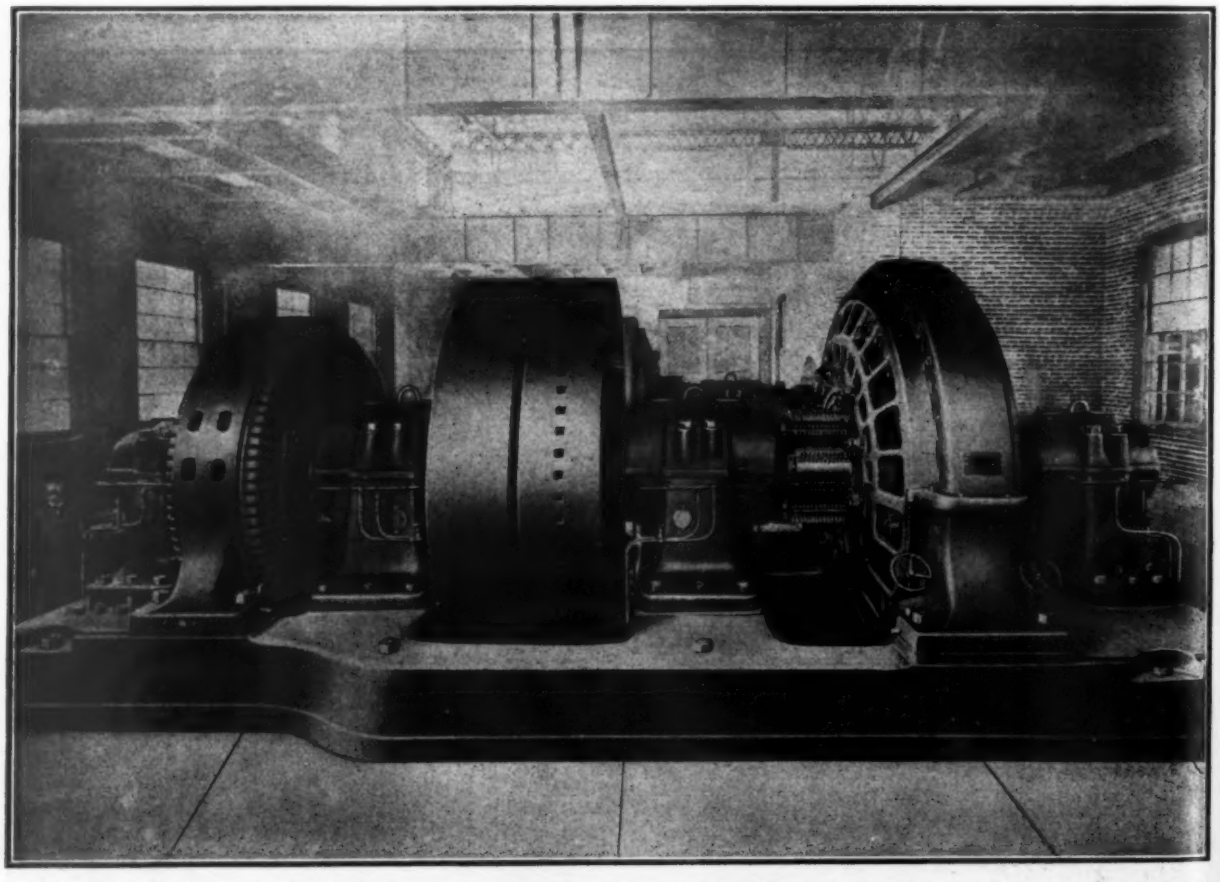


8,000-Horsepower Reversing Motors Driving 30-Inch Universal Plate Mill at Illinois Steel Plant.

great prominence in the determination of the size of the roll equipment which is required. A tonnage of 20,000 per month will be usually obtainable only upon the basis of operating for hourly and no doubt for twelve-hour periods at rates from 25 to 100 per cent greater than the average monthly rate. Such high rates of rolling determine in large measure the capacity as to heating for which the equipment must be designed. Failure to consider this will no doubt result in limiting the capacity of the mill. When the motor installation is once made it is decidedly difficult to make alterations which will permit of a material increase in the capacity of the electric drive.

The stresses encountered in rolling vary over such wide limits, and the short-time demand for power may be so considerable, that the load-factor (average input to the motor divided by maximum input to the motor) or the capacity-factor (average input to the motor divided by the rated capacity of the motor) may be quite low. In fact the experience of the past has indicated that there are but few constant-direction drives wherein the monthly load-factor will exceed 40 per cent, and for reversing drives this figure as applied to the motor driving the motor-generator set will not exceed 60 per cent. It is very probable that the monthly load-factor on constant-direction drives will vary from 15 to 40 per cent, and on reversing drives from 25 to 60 per cent. When one is confronted with such figures, it appears that too much stress should not be placed upon the question of efficiency and power-factor at the rated capacity of the installation, since as indicated, the percentage time at which the equipment is operated at or near its rated capacity is very small indeed. A few points in efficiency and power-factor may well be sacrificed in the interest of increased reliability.

One must not lose track of the altered psychology which exists in rolling-mill practice since the advent of the electric-motor drive. In the old steam-engine drive in constant-direction mills, considerable care was taken that the draft was made well within the limits of the capacity of the engine. In engine-driven reversing drives, if the draft is too great, the piece is backed out, the draft reduced, and the piece then again entered. However, in the electric drive the foregoing has not been found to be the situation. Rollers soon learn that the motor circuit-breakers may be set up just a little bit higher, and in that manner the piece may be readily driven through the rolls at increased draft. It is of prime importance, therefore, that from the mechanical standpoint and the standpoint of heat dissipation, electrical equipment must be thoroughly reliable. In the past, the steel industry in this country has operated under periods of high capacity followed by periods of low capacity. Since it is during periods of high capacity that the greatest stress on the equipment occurs, and since also it is during such high-capacity operation that the highest prices are usually obtained for the output, it is essential that the question of reliability of operation be the main consideration in determining an electric drive. Repairs to electrical equipment in general consume more time than repairs to engine equipment. In flood times tonnage not rolled is tonnage lost; therefore, it will appear that less consideration should be given to the purely electrical characteristics of the roll motor equipment than to the mechanical characteristics, such as stiffness of shaft, stiffness of frame, size of air gap, size and lubrication of bearings, thickness and quality of bearing metal in the bearings, etc. The question of ease of repair of the motor equipment, that is, the quick replacing of a few coils, should be provided for. The control equipment should be as simple as possible, as it is believed that experience has



**Motor-Generator Set Comprising 1,300-Horsepower Motor and 3,000-Kilowatt Direct-Current Generator, with Two 50-Ton Flywheels—Illinois Steel Company.**

shown that some of the earlier complications to obtain speed variation, etc., are in many cases not commercially required.

In many specifications for electric drives for reversing mills, there has been specified in the past a speed of reversal from full speed in one direction to full speed in the opposite direction which, it is believed, experience has shown could not be utilized. In the routine operation of a reversing mill there is a considerable time-element involved in the ordinary operation of reversing the direction of the table drive, manipulating the piece, operating the screw-down, etc., involving a considerably greater total time than was specified in most of the installations as the time from full speed in one direction to full speed in the reverse direction. This has imposed upon the electric designers conditions which have been decidedly difficult to meet, and it is feared, has introduced complications which could well have been avoided had the specifications as to reversal been consistent with the actual time involved. This illustrates one of the points concerning which the greatest care should be exercised in the interest of obtaining a simple and reliable outfit.

The question of providing the cleanest possible surroundings for the electric equipment is, I believe, being given the thorough attention which its importance warrants. This matter well deserves all the thought and ingenuity which may be exercised. It is very probable that distinct air-cleaning and air-cooling plants and the necessary fans for supplying such air to the motor drives may, in many cases, be warranted.

Comparisons are frequently made of the relative cost of electric drive and steam drive for rolling mills. Exception may be taken to some of the items in most of these comparisons, depending upon the point of view and also the mental attitude of the person involved. In practically all of the larger steel plants—at least those having blast furnaces—sources of so-called "waste" gases or "waste" heat exist. The efficient use of such sources of energy in centrally located electric power stations is available to such an extent that there are but few such plants where electric power, when all factors are considered (including investment, etc.) cannot be generated for less than one-half cent per kilowatt-hour. In several of the larger municipalities where power is generated in stations with capacities of over 100,000 kilowatts, power may actually be purchased not far from one-half cent per kilowatt-hour. Moreover, experience has shown that the power supply when obtained from such large generating stations is very reliable. With such cost of power as a consideration, he would be bold indeed who would attempt to show the superiority of engine drive over motor drive from the standpoint of operating costs. There are but few cases, it is believed, where "pounds of coal per ton of product" is not materially lower in electrically driven mills than in corresponding steam-driven mills. Mill superintendents who have handled steam equipment for many years, and who have also had experience with electrically driven equipment, have been found practically a unit in their preference for the electrically driven equipment. Whether steam-turbine direct drive, gas-engine direct drive, gas-turbine direct drive, etc., will prove formidable competitors to the electric drive is problematical. The centralization of the generation of power lends itself to taking advantage of the diversity-factor of the plant involved, so that the plant load-factor may be materially increased. There are, of course, certain isolated cases where the utilization of waste heat is such that a boiler installation with engine drive is most economical. However, in some of these cases perhaps it may still pay to incur a small loss and convey the steam generated to the central power station, thereby obtaining the benefit of the diversity-factor indicated.

## Electrical League of Cleveland Opens New Quarters.

On Thursday, September 7, the 1,200 members of the Electrical League of Cleveland celebrated the formal opening of their unique quarters on the roof of the Statler Hotel. The club rooms consist of a main dining-room, private dining-rooms, a billiard room, game room, ladies' parlor, a large main lounging-room foyer, office and several smaller rooms. Located 15 stories above the heart of Cleveland's business section, the fresh winds of Lake Erie cool the brows of the tired electrical business men as they take a few minutes off at the League. The rooms have so many windows that it has been called "The Glass House." Heavy rugs, comfortable massive furniture and beautiful silk draperies add to the beauty and comfort of the quarters. The rooms will be open on week days from 8:30 a. m. to 11:30 p. m., and on Sundays and holidays from noon to 9:00 p. m. Table d'hote lunches and dinners will be provided by the hotel, and a la carte service is available at all times. Tipping has been entirely prohibited through a special arrangement with the hotel.

Letters of congratulation have been pouring in from all parts of the United States and Canada. Many visitors from all over the country attended the opening.

The officers of the organization are: N. H. Boynton, president; J. T. Kermode, vice-president; H. O. Leinard, treasurer, and R. S. Dunning, secretary.

Dining Room and Lounging Room of Cleveland Electrical League's New Quarters.

# Lighting of Steel Mills With Quartz Lamps

## Brief Description of the Installation in the New Plant of the Minnesota Steel Company and Some General Remarks on the Lighting of Large Interiors

By George C. Keech

INDUSTRIAL lighting, particularly for iron and steel mills, is of great importance to the manufacturer and to the laborer. In the case of the manufacturer it has been definitely proved that by proper illumination he can increase his output five per cent. The value of the total output of the manufacturing industries in the United States for the period of one year is between twenty-five and thirty billion dollars. A five per cent increase will mean that in the course of a year with proper illumination the manufacturers would increase their output over one billion dollars. In addition to the increased output there is a marked improvement in the quality of the output, which is also a matter of great value to the manufacturer. Another advantage is that with proper illumination inspection is much easier, it tends to produce cleanliness about the plant and give it a more cheerful aspect.

To the laborer industrial lighting is of importance, because it is one of the best means of reducing the chances of accident. The reduction in the number of accidents has been shown to be about 25 per cent. Illumination increases the efficiency of the laborer, because he can work continuously without interruption when there is any necessity for adjustments or fine measurements. Industrial lighting reduces the objectionable feature of eye strain, making the employee useful over a longer period of time; the surroundings are more cheerful, which in turn reflects upon the condition of the workman, making him more satisfied, more efficient, and more healthy. Taking into consideration that of the total number of wage earners in the United States—38,167,366—over one-fifth are employed in the manufacturing field, and that the total value added to the product in the course of manufacture is about one-third of the total output value, or between eight and ten billion dollars, the size of the field and the number of people affected can readily be appreciated, and some idea gained of the importance of this phase of the illuminating profession.

Industrial lighting is of interest to the engineers, because of the diversified problems it presents for solution. Each installation has conditions that are particular to itself. There are many varying quantities to be met and factors to be considered before any recommendation for illumination can be made. There have been developed and collected many tables, curves and other data which pertain to general lighting installations.

The most recent complete steel plant erected in the United States is that of the Minnesota Steel Company, in New Duluth, Minn. The ground was broken for the power house in 1912, and furnaces and mills have followed each other in construction until the present time. The completed mills have been in operation since 1915. There now stands at the head of Lake Superior a plant capable of turning out the same classes of work as are accomplished at the foot of Lake Michigan, in Gary and South Chicago, and in the older districts of Pennsylvania and Ohio.

Iron and steel trade journals have published complete details of the mechanical and electrical equipment of this plant, and this article will treat only of the lighting system in the larger manufacturing buildings.

Four Allis-Chalmers 3,000-kilowatt gas-engine-driven generators deliver current at 6,600 volts to six substations, where it is stepped down to 440, 220 and 110 volts alternating current.

Motor generators at these substations deliver direct current to the crane motors, other variable-speed motors and to the lighting units at 250 volts direct current. The variation at the lighting units is no more than 10 volts.

There are at the present time in operation in the various high buildings a total of 96 Cooper Hewitt quartz-tube

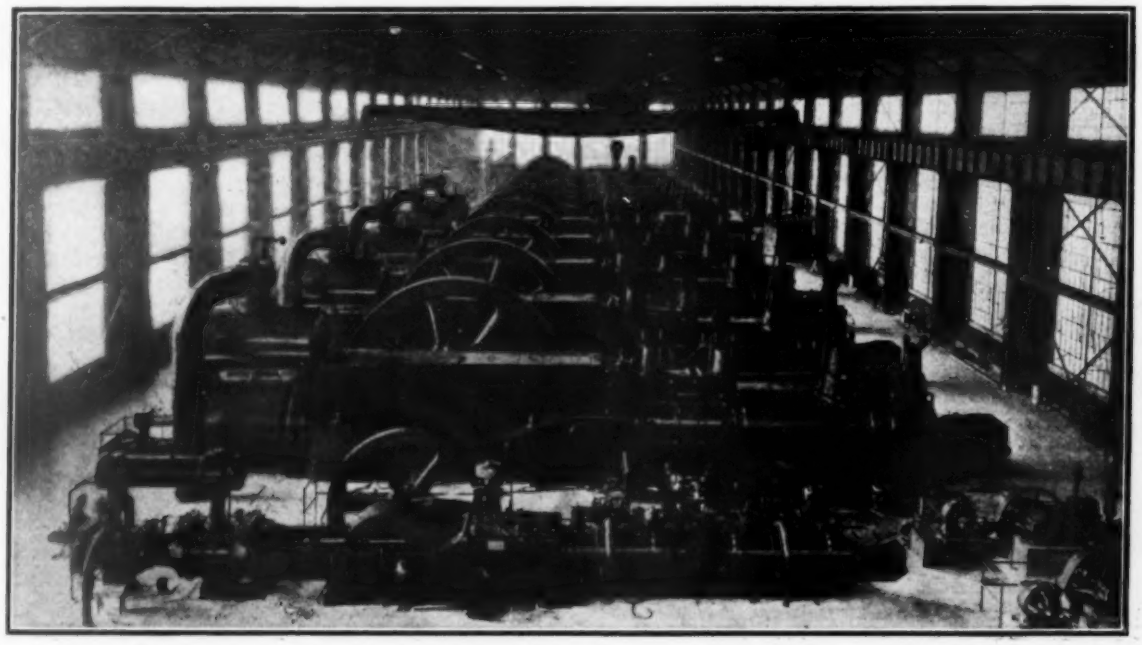


Fig. 1.—Interior of the Power Station of the Minnesota Steel Company at Duluth, Showing Lighting with Quartz-Tube Lamps.

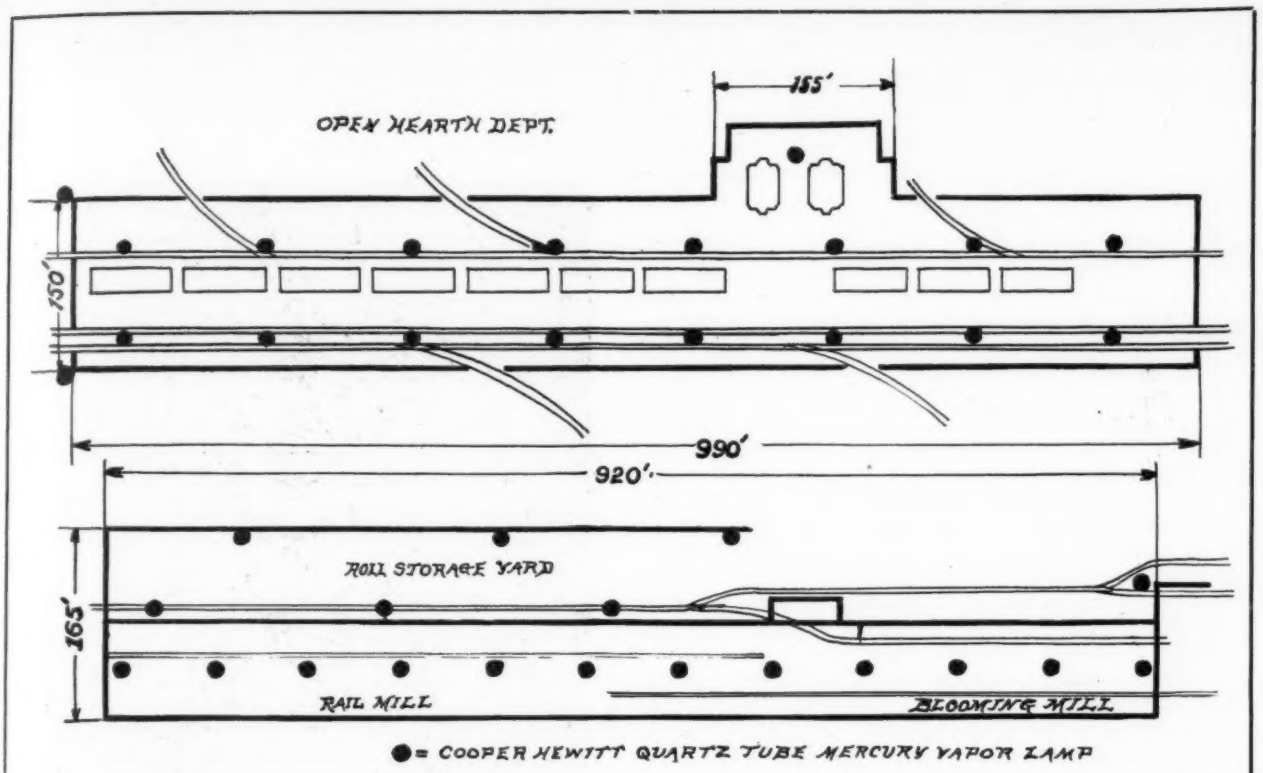



Fig. 2.—Open-Hearth Department and Rail Mill and Storage Yard of the Minnesota Steel Company, Showing Location of Quartz-Tube Mercury-Vapor Lamps. In the Rail Mill and Blooming Mill There is One Lamp Installed for Every 6,000 Square Feet of Floor Area.

Interior of Collinwood Shops of the New York Central Railroad Showing Conditions Very Similar to Those Found in Iron and Steel Mills—Lighting is Accomplished by Means of Quartz-Tube Mercury-Vapor Lamps.

mercury-vapor lamps. These lamps are the standard Type Z, operating in multiple on 250 volts direct current, at 725 watts each. The burners are equipped with standard reflectors and covered with clear-glass globes.

The lamps hang at an average of 45 feet throughout, or at a sufficient height to clear the crane travelers.

Fig. 1 shows the interior of the power-generating station, and the lighting units may be seen hanging just below the lower cords of the trusses. In this building 540 feet by 115 feet, 11 725-watt quartz lamps cover this area of 62,100 square feet, with an even illumination averaging two foot-candles at practically one-eighth of a watt per square foot. The lamps are staggered, as can be noted from the picture.

In Fig. 2, the top part of the drawing, is shown the open-hearth department. This building is 990 by 150 feet, equipped with 16 quartz lamps, at an average of 10,000 square feet per lamp. The required intensity of illumination in this department is low.

In the lower half of Fig. 2 is shown part of the rail mill, blooming mill and roll storage yard. In the rail mill and blooming mill the lamps cover an average area of 6,000 square feet each.

Other departments which are equipped according to local required intensity are those of the billet, storage, pit furnaces, blast furnaces, merchant mills, etc.

All the departments above mentioned are operating at full capacity day and night.

This same type of lamp is used in yard lighting, lamps being hung from the corners of buildings, as shown in Fig. 2.

In yards of other steel mills and also in railway switch yards these lamps are often suspended at the top of steel towers ranging from 75 to 100 feet in height, each lamp giving satisfactory yard lighting over areas of from 50,000 to 200,000 square feet.

Fig. 3 shows the interior of a building similar in construction to a steel mill (New York Central railroad shops at Collinwood, Ohio). This picture was taken at night by the light of Cooper Hewitt quartz lamps, which are arranged in a single row down the center of the shop, and the distribution of light on the work below shows results obtained from this system of illumination.

The well-known greenish color of this light is extremely restful to the eyes, which are necessarily under strain when their owners are engaged in steel-mill processes and the absence of glare adds to the safety of movements.

The magnifying character of the light facilitates inspection of the work, care of the machines, and aids in keeping production up to daylight standard.

This installation of quartz lamps in the Minnesota Steel Company's plant is considered typical of modern steel-mill illumination. In the Minnesota plant it has been the experience of the engineers that the present lighting installation requires a minimum of attention, and this, of course, is an important item where lamps are required to be hung at great heights.

## New Electric Fountain for Peoria Park.

Four or five decades ago, a pioneer resident of Peoria, Ill., built himself a handsome residence and embellished the lawn with a costly imported bronze fountain. For years the fountain played in the door-yard until finally it fell into disuse. Dead leaves filled the basin cracked by winter frosts and summer heat, but the procession of the seasons added to the beauty of the bronze by covering its surface with the rich, dark green *patina* which time lends to the metal.

Recently, a public-spirited citizen of the progressive community bought the fountain and presented it to the city. It was decided to install it in Glen Oak Park, close to a driveway. A cement pool, 45 feet in diameter, its rim bearing four massive vases for flowers, forms the frame for the fountain. The bronze is mounted on a cement plinth, from whose base six frogs spout sparkling streams into the pool. From the driveway, the fountain is seen gleaming in its sunken garden against a background of trees and flowering shrubs.

To Walter Murray, secretary of the Peoria Park Board, belongs the credit of having conceived and pushed to execution, a plan of electrical illumination which makes the fountain a jewel resplendent with many colors at night. The Crawley Electric Company, of Peoria, designed the installation and did the work.

Night View of Electrically Lighted Fountain at Peoria, Ill.

Concealed in the base of the plinth are six waterproof pockets arranged in a circle and covered with heavy plate glass. Each pocket contains four 60-watt Mazda lamps with natural-glass globes of red, green, canary and purple. Automobile reflectors in the pockets project the flood of colored light upwards in inverted cones, to illuminate the plinth, the pediment of the bronze and the drifting spray from the upper jets. A bowl shaped like a sea-shell supports playing cupids, disporting in the jets of water rising from the perimeter of the bowl. The cupids and the jets are lighted by twelve 60-watt Mazdas laid directly in the water of the bowl. Waterproof P. & S. sockets were used. All connections are laid with jute, puttied, and served with several coats of shellac. No trouble on account of short-circuits due to water has been experienced.

Service is obtained from the parkway ornamental-post lighting system by means of 180 feet of steel-taped cable laid directly in the ground and running to a manhole close to the fountain. In the manhole are located a fused control switch, a Reynolds four-light flasher and the valve for the control of the water. From here, a lead-covered, single conductor No. 14 wire runs in a two-inch conduit to the center of the plinth for distribution to the base and top lights.

The fountain is illuminated during the hours the ornamental park lighting system is on. A park patrolman closes the switch in the manhole and the sparkling play of colors on the water begins. Red and green, canary and purple, follow in alternating sequence, below and above, forming a charming kaleidoscope play of colors that draws thousands of visitors every pleasant evening.

A former neglected corner has actually been transformed into the most popular spot in the park by the aid of electricity.

# COMMERCIAL PRACTICE

**New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity**

## Lighting Features of a Central-Station Office Building.

During the past several months the electric flag sign has enjoyed exceptional popularity and many hundreds of them have been installed. Flood lighting of the American flag is, however, becoming equally as popular and from a spectacular standpoint even more effective, according to many. The latter scheme has been adopted by the Arkansas Valley Railway, Light & Power Company, of Pueblo, Colo., in connection with the illumination of its new office building. A brief description of this building was published in our last issue.

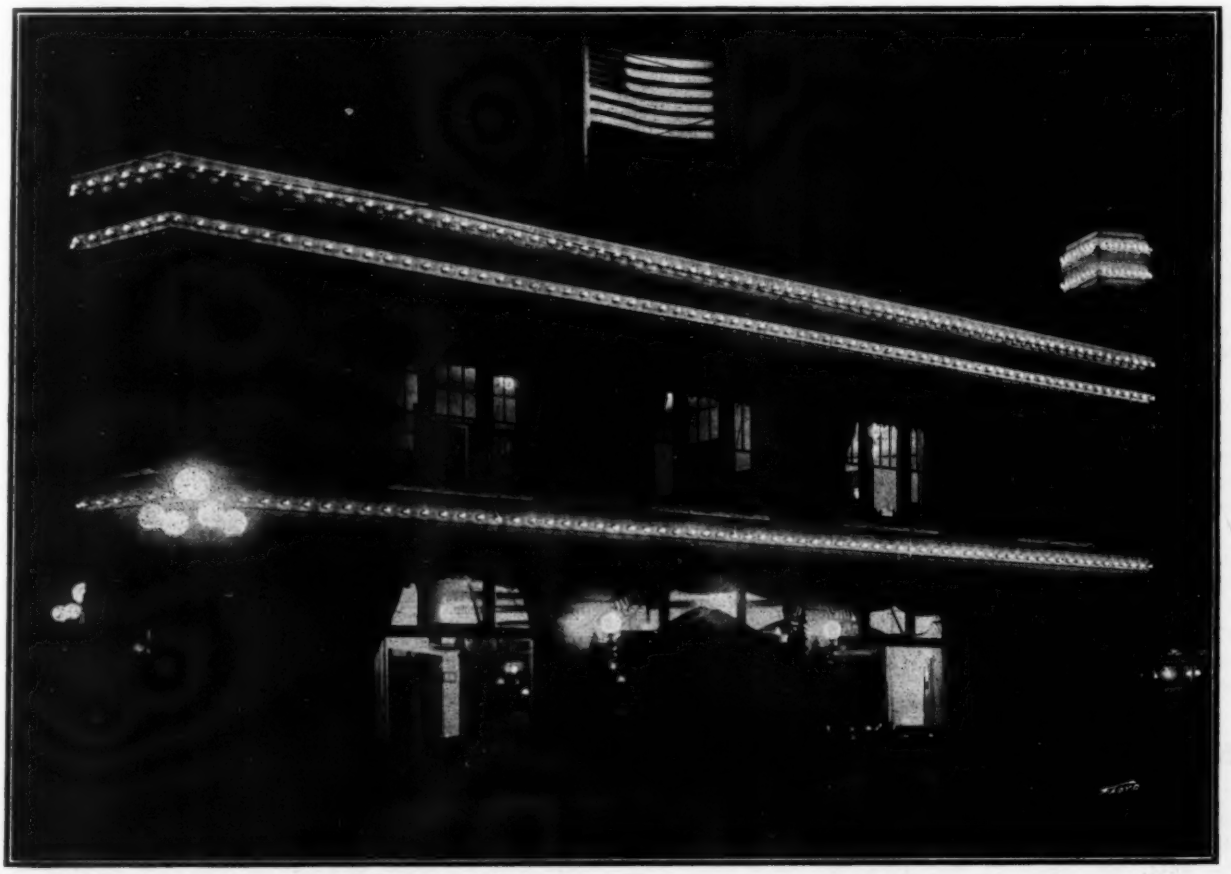
Instead of an artificial flag to attract the attention of the passersby at night time, the company has a real American flag, 14 feet long, made brilliant by means of spot lights. The building is triangular in shape, making it possible to install three flood lamps, one in each corner of the roof. They are equipped with 500-watt, type "C" lamps and are tilted to an angle of 30 degrees and point toward each other. This forms a brilliant apex of light concentrated on the flag, and the public sees no visible means of lighting the flag.

The accompanying illustration of the building and flag gives some idea of how prominent the latter stands out in the dark. There is always a breeze in Colorado at night time, and the flag on top of the building attracts the attention of all who happen along. There are 1,400 lamps used in the outline lighting.

While there are other and more pretentious electric buildings throughout the country, it is doubtful whether there is one more attractive and convenient than the one erected in Pueblo. Advantage was taken of the shape of the ground—a small triangle bounded on three sides by city streets and right in the center of the business district. The company operates the street railway system of Pueblo and street cars pass three sides of the building, making it exceptionally convenient for all patrons to stop in and pay their electric bills.

The entrance opens into a small rotunda, around which are grouped the various departments and a stranger need not walk far to discover the department he desires.

The company has installed as a part of its lighting equipment for the building, a fireproof transformer vault which meets the highest standards of the Underwriters. This the company will use to demonstrate to contractors and architects, the best and safest transformer vaults on the market.



**Office Building of Arkansas Valley Railway, Light & Power Company Showing Flood Lighting of American Flag and Other Decorative Features.**

## New-Business Methods Productive for Columbus Company.

For showing the development of the domestic use of electricity through educational campaigns some interesting statistics are given by the Columbus (O.) Railway, Power & Light Company, which cover sales during the entire period since the company adopted its present methods. Recent growth requires the installation of new equipment to meet the demand, the most important being a 7,500 kilowatt generator. This will be capable of furnishing enough electricity to supply 188,000 lamps or of furnishing sufficient energy to serve approximately 20,000 homes. A large per cent of this new output will go to manufacturing plants for power purposes. A 1,500-kilowatt motor-generator and a 500-kilowatt rotary converter will also be added to the company's facilities.

By special effort, through advertising and personal soliciting, the company has been able since March 15, 1916, to contract for the wiring of 490 already-built houses, in addition to the business that has come from new houses. Since the first of the present year the company has consumed in wiring 147 tons of copper.

In the appliance end of the company's activities the new business department has sold a total of 10,137 household electrical devices since it opened for business on August 1, 1913. About one-half this total is credited to the past year, which illustrates the increasing ratio of demand as people become accustomed to the use of electricity in the home for purposes other than lighting. The list of articles includes 3,928 electric irons, 1,432 vacuum cleaners, 369 washing machines, 564 toasters and 189 percolators. Chafing dishes, disk stoves, water heaters, hair dryers, portable lamps, radiators, sewing-machine motors and other articles make up the total.

## Kansas City Company Turns Over Wiring Contracts to One Contractor.

The Kansas City Light & Power Company has made a contract with the G. G. Burkholder Electric Company for the wiring of houses under contracts made by the light company with its customers. The company is promoting the business, and the salesmen get the contracts, at the schedule; the customer pays in 12 installments. The light company pays the contractor cash at a substantial discount from the schedule. Heretofore the light company has distributed this work among several contractors, but its granting of low prices for wiring has not allowed much profit for the contractors and very little if any for the company itself. The light company will make a profit out of the business now—more than enough to pay all of the expenses of it.

Within a few weeks the company probably will arrange with other contractors, so that they can turn contracts in to the company, which will pay them cash and handle the customers' accounts. During the first week in September 81 contrarcts were turned over to the G. G. Burkholder Electric Company, and it is expected that 400 houses a month will be wired before December 1.

The present schedules of house-wiring prices in Kansas City are the same as have existed for the past five years, and are said to be still fair prices for the work, despite advances in cost of materials.

## Searchlight on Hotel Attracts Wide Attention.

For purposes of advertising and attracting the notice of automobile travelers approaching the city, the management of Hotel Bancroft, Worcester, Mass., has had mounted on the hotel roof, about 125 feet above the street level, a 24-inch searchlight of 60 amperes capacity, operated on 110 volts.

The light is installed on a concrete base about 4 feet square and 3 feet high, and is rotated about 5 times a minute, after the fashion of a revolving light in a coast lighthouse, by means of a 0.25-horsepower motor, connected to the frame of the lamp by means of a gear and worm.

The light is visible at a distance of 15 to 25 miles, and on hazy or foggy nights the pencil of light is seen sweeping the sky over the city, being directed at about 45 degrees above the horizontal.

## Illuminated Signs Advertise House-Wiring Campaign.

The Boston Edison Company has distributed among its score of district stores, and to all electrical contractors in the territory, illuminated signs portraying a lighted house and carrying the words: "We have wired 2,500 houses for Electric Light on the Easy Payment Plan. Why Not Yours? Inquire Within." The sign consists of a model house painted dark red and green, the dimensions being about 3.5 feet long and 2.5 feet high. Through openings simulating windows shines the light from a number of incandescent lamps installed within, giving the effect of an actually lighted home. The words "Electric Light" are in miniature illuminated letters.

The accompanying illustration shows the lighted sign in place in the Lexington store. Below is a placard advertising the company's August range sale, at $15, payable in installments, and a table is shown containing some of the attractive appliances carried in the district stores. At one

Electric Sign Given by Edison Company to Contractors Who Participate in House-Wiring Campaign. Since These Signs Have Been Used Over 4,000 Houses Have Been Wired.

side is a specimen porch lamp, inscribed, "Ask about this fixture."

The contractors receiving the illuminated house-wiring signs are expected to keep them lighted a reasonable length of time each month, this provision enabling them to repay the Edison Company in part for its outlay. District managers visit the stores in which the signs are installed, from time to time, to see that the requirement is being lived up to.

## Gasoline Filling Stations Offer Opportunities for Business.

Handsome lighting appointments are an adjunct to a new gasoline distributing station of the Texas Company on Commonwealth Avenue, Boston. Each of the four pump towers, which are about 12 feet high, is lighted by four in-

Gasoline-Filling Station Showing Use of Lamps.—Motors Also Used Here.

candescent lamps in frosted balls, besides a circular glass transparency which surmounts the tower. The lights not only render the filling station very conspicuous at night, but they also illuminate the driveway which runs completely around the station, enabling automobiles to enter at one side and leave by the other. Eight automobiles can be supplied with gasoline simultaneously, as each tower is equipped with two pumps, with hose which can be carried to either side. Compressed air, produced by an electrically driven compressor, is supplied free to autoists.

## Street-Lighting Extension in Salt Lake Using Luminous Arcs.

The Utah Power & Light Company has commenced work on the installation of the special street-lighting system for Salt Lake City, comprising lighting improvement district No. 2, which was recently created by petition of the property owners. The contract for the installation of this system calls for an ornamental standard which is fitted over and around the regular steel trolley poles, completely concealing them. Mounted on the top of this standard is three five-ampere luminous arc lamps. The standards are 100 feet apart on each side of the street.

## Reduction in Rates Announced by Scranton Company.

Reductions in rates for electric light and power have been filed with the Public Service Commission by the Scranton Electric Company. The new schedule, which will be effective October 1, provides for a reduction from 10 to eight cents per kilowatt-hour for lighting and also provides for a minimum rate of 50 cents a month instead of $1 per month. Provision is made for a graded scale of rates where the meter rate is in effect. The rate will be eight cents per kilowatt-hour for the first 150 kilowatt-hours in any month, seven cents for the next 100 kilowatt-hours, and six cents for all in excess of 250 kilowatt-hours. It is estimated that the reduction in rates will amount to 20 per cent.

## New Office for the New York and Queens Company.

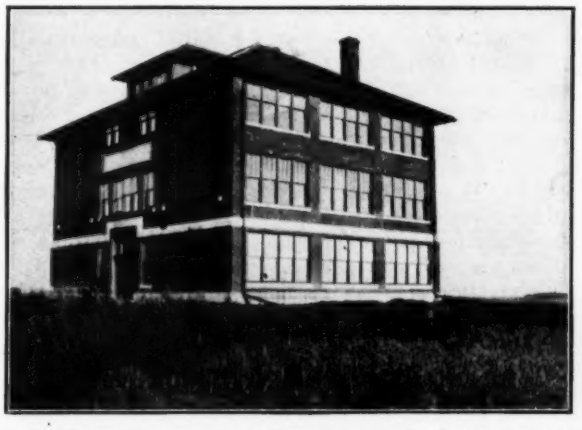
The Ridgewood section of Queens Borough, New York City, which is supplied by the New York & Queens Electric Light and Power Company, is growing at a very rapid rate and improvement in facilities are being made continually. The company is anticipating the demands for service by opening an attractive office on the best thoroughfare in this section. This show room and office is in charge of J. M. Murtha. The company's contract agent, C. A. Barton, is rapidly stocking up with the latest improved models of current-consuming devices.

## New Iowa Power Line to Serve Farmers.

With the completion of the transmission line of the McGregor Electric Light & Power Company to Postville, Iowa, another large section of wealthy Iowa farming country has been added to the territory supplied by electricity from the power plants of the Upper Iowa Power Company, at Decorah. The lines of this company radiate out from Decorah over an area about 100 miles wide in northeastern Iowa and supply hundreds of farmers and scores of towns and villages with light and power.

The McGregor Company, of which G. S. Donaldson is president, has a steam plant at McGregor and for some time has been supplying Monona, 14 miles distant, with power. The company has now extended its line 10 miles beyond Monona to Luana and Postville and will buy power at the latter place from the Upper Iowa Power Company for its whole system, using the McGregor plant hereafter only for emergency purposes.

An interesting feature of the extension of the McGregor line to Luana, a village of some fifty inhabitants, is the use that will be made of electricity in the rural consolidated school which has just been built on the prairie near there. The school, erected at a cost of $36,000, is the first distinctly rural consolidated school in northeastern Iowa. It was built on the initiative, under the supervision and at the expense solely of farmers and in up-to-dateness is not excelled by a school in a large city anywhere. Every manner of electrical device has been installed, and five motors are used on the premises. Water is pumped by electricity



New School in Iowa Equipped with Motor Drive, Electric Cooking Equipment and Modern Ventilating and Lighting System.

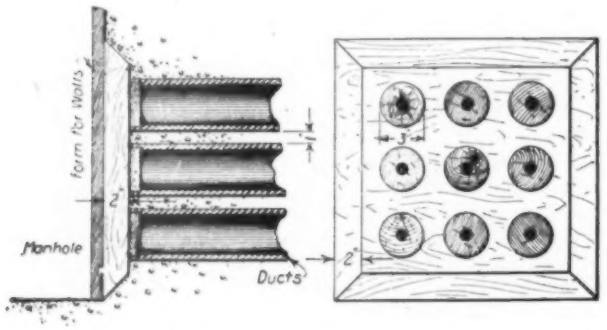
to supply drinking fountains and a boys' and girls' lavatory and toilet in connection with every schoolroom. The domestic-science department has electric stoves and all manner of electrical utensils. The manual-training department is fully equipped with electric power. Vacuum cleaners will clean the whole building and an electrically operated air-washing system will render every bit of air germless before it is allowed to enter the schoolrooms.

# ELECTRICAL CONSTRUCTION

**A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment**

## Guide for Proper Spacing of Underground Conduits at Entrance to Manhole.

The Public Service Electric Company, Newark, N. J., has been placing wires underground on Nassau Street, Princeton, N. J., a distance of about 0.62 mile. Nine ducts




**Arrangement of Underground Conduit at Entrance to Manhole, Used at Princeton, N. J.**

laid in cement, with concrete manholes and iron service conduits, characterize the construction, which is in charge of J. E. Armstrong, field engineer for the company. There are nine ducts throughout, laid in three tiers of three each, the conduit being 3 and 3.5-inch H. W. Johns-Manville fiber duct.

A feature of the manhole construction is the use of a new type of auxiliary form designed by Mr. Armstrong. This consists of wooden buttons about one inch thick and of the same diameter as the ducts, which are screwed to a form made up of two-inch spruce planks cleated together and beveled at the edges. This form is attached to the outside of the wall form into which the concrete for the manhole is poured, in proper position opposite the point where the ducts are to enter the manhole. The wooden buttons on the form are for the purpose of furnishing a guide to the placing of the ends of the ducts as they are laid tier after tier in concrete, and to insure the entrances being in perfect alinement and at the proper spacing with at least one inch of concrete between ducts.

The practice is to lay the ducts which pass the manhole at least five inches from its wall, in order to insure room for the expansion bolts by which the racks to support the cables are secured.

## New Electrical Code Adopted by City of Portland.

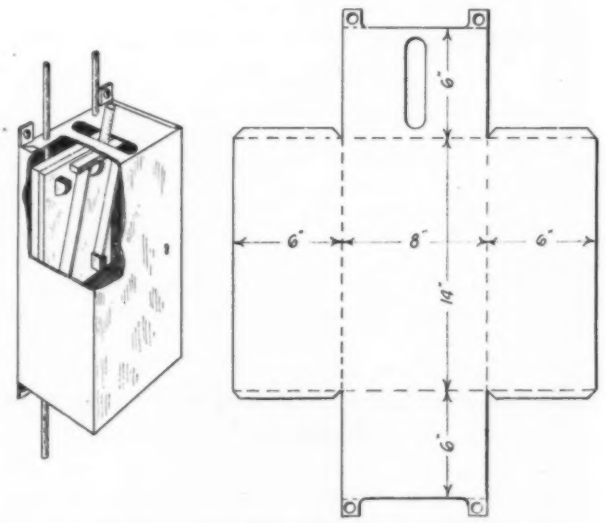
The city of Portland, Ore., has adopted a new ordinance regulating the installation and operation of electric wires, appliances and apparatus. This ordinance has 112 sections, of which 89 cover the specific requirements of its Electrical Code. The other sections cover general provisions, such as the creation of the Electrical Division in the Bureau of Buildings, the qualifications of its chief electrical inspector and deputy inspector, their powers of inspection and reinspection, registration of applicants for electrical permits and of supervising electricians, issuance of inspection certificates, fees, penalties, etc.

In general, the new Electrical Code, which is included in the body of the ordinance, is based on the National Electrical Code, but it includes many additional provisions largely in the nature of specifications to insure the best practice in the installation and operation of electrical equipment and thus reduce to a minimum any possible fire and life hazards.

## Design of Knife-Switch Box for Fire Protection.

Knife switches controlling motors, or other electrical apparatus drawing a large current, should never be installed in a shop unless fully inclosed. Fires, started by the arc formed on opening or closing the switch, often result if inflammable material is in the immediate vicinity. One large factory has solved this problem by placing covers, such as shown in the diagram herewith, over every switch in the several buildings.

A piece of sheet iron is laid out and cut to the pattern and general dimensions indicated. The sheet is then bent along the dotted lines and the joints soldered, thus forming a box-like cover. Next the switch handle is removed and a piece of broom stick, ten inches long, substituted. The metal box can now be screwed over the switch, in such a position that the handle will project through the slot at




**Cover for Knife Switch and Pattern for Making One.**

the top. This permits the switch to be opened or closed at will, yet perfect fire protection is afforded at a comparatively low cost.

Of course, should there be outside wiring, holes may be provided at the top and bottom of the box and provided with insulating bushing such that the wires will pass through with a snug fit.

K. M. Coggeshall.

# Polyphase Motor Windings—VII

By Justin Lebovici

*In discussing polyphase motor windings the author first took up closed two-layer windings, elucidating the presentation with examples and illustrations. This was followed with a consideration of open windings, which is continued in the present installment, attention being here given to wave windings. The next installment will deal with lap windings in unequal groups. In future installments single-layer windings and windings for two speeds will be taken up and special attention given to the mechanical design of windings and to insulation.*

### Wave Windings.

It has been shown that an open wave winding is obtained by dividing the corresponding closed simplex ($a$=1) wave winding into $2n$ sections. If the winding is multiplex (or half the number of circuits in the closed winding greater than one) we have to divide the winding into $2na$ sections. In order to obtain a symmetrical winding the number of conductors has

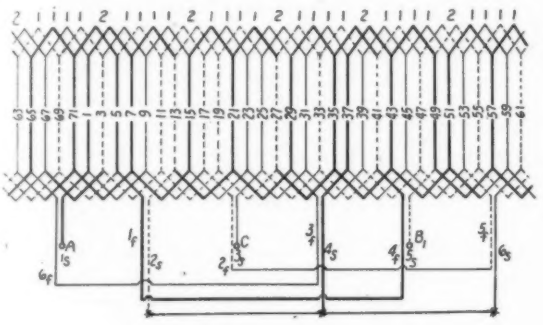


Fig. 85.

to be divisible by $2na$. The resulting $2na$ sections can be connected either single-circuit or double-circuit.

$n$ stands for the number of phases and equals two in the quarter-phase winding and three in the three-phase and six-phase windings.

$a$ stands for half the number of circuits in the original closed wave winding.

Formula (8) reads

$$y=(S\pm 2a)/p \qquad (8)$$

and since in the windings under consideration there are two

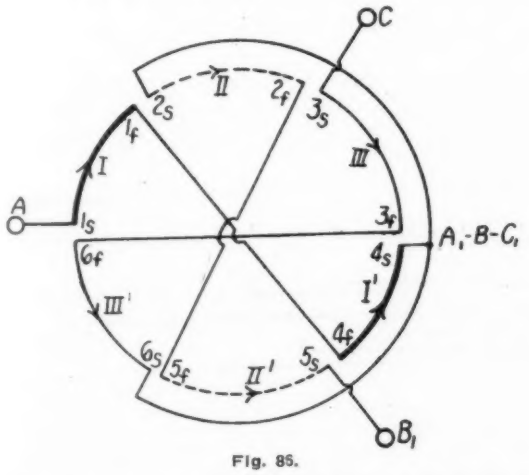


Fig. 86.

coil sides in each slot, we can write $S=2Z$. This placed in (8) gives

$$y=(2Z\pm 2a)/p \qquad (22)$$

where $y$ is a whole even number. Equation (22) can be written:

$$py/2=Z\pm a.$$

or since $y$ is a whole even number, $y/2$ is any whole number, and we can write

$$Z=\text{any whole number}\times\text{pairs of poles}\mp a \qquad (23)$$

We had, besides, $Z$=any whole number$\times 2na$ (24)

It follows for a perfectly symmetrical wave winding:

*The number of slots must be by "a" more or less than a multiple of the number of pairs of poles and at the same time divisible by 2na.*

For a *simplex wave* winding it follows that the number of slots should be one more or less than a multiple of the pole

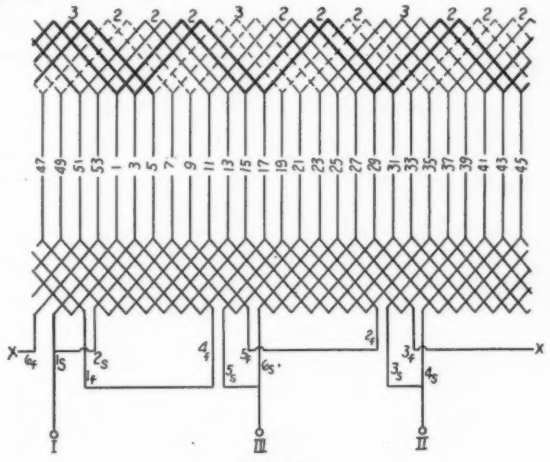


Fig. 87.

pairs, and at the same time divisible by 6 for a three-phase winding, or by 4 for a two-phase winding.

For a *multiplex wave* winding it follows that the number of slots should be $a$ more or less than a multiple of the pole pairs, and at the same time divisible by $6a$ for a three-phase winding, or by $4a$ for a two-phase winding.

In laying out these windings it is best to start from the table for the closed winding and use the rules given in connection with the closed wave windings modified for our case. From equation (22) we obtain

$$y_R=(Z\pm a)/p \qquad (25)$$

### Example No. 28.

A ten-pole machine has 36 slots, 36 coils and it is proposed

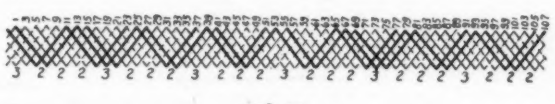


Fig. 88.

to wind it three-phase. The number of slots per pole $Q$ and slots per pole and phase $q$ are as follows:

$$Q=36/10=3.6 \text{ and } q=1.2$$

The number of slots per pole and phase is a fractional number and to obtain balanced or symmetrical phases as regards voltage and phase displacement, the number of coils per pole and phase cannot be the same under all poles. We have to use either a wave winding or, since the type of end connector has no influence on voltage and phase displacement, we could use the same arrangement of conductors or coils as the wave winding but make the end conductors lap. The latter course leads to the lap windings in unequal grouping.[1]

1 See article by E. M. Tingley, "Two-Phase and Three-Phase Lap Windings in Unequal Groups." ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, January 23, 1915.

In the present case we choose to make a wave winding, since this arrangement of end connectors gives a minimum of connections between groups, and a winding of very neat appearance. We have $Z=36$, $S=72$, $p=5$. Conductors in each group $=S/2na=72/6=12$

Furthermore, equations (23) and (24) are fulfilled.

Equation (23):

$$36=7\times5+1=7p+a$$

Equation (24):

$$36=6\times2\times3\times1=6\times2na$$

Equation (25):

$$y_R=(36\pm1)/5=35/5=7=(Z-a)/p$$

Equation (22):

$$y=2y_R=14.$$

We select $y_1=7$, $y_2=7$.

Table XXIII is made up of $2p(=10)$ vertical columns and $S/2p(=7.2)$ horizontal rows as previously explained. The difference between two vertical columns is alternately equal to $y_1$ and $y_2$, while the difference between two horizontal rows is equal to $2a=2$.

TABLE XXIII.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 8 | 15 | 22 | 29 | 36 | 43 | 50 | 57 | 64 | |
| 71 | 6 | 13 | 20 | 27 | 34 | 41 | 48 | 55 | 62 | |
| 69 | 4 | 11 | 18 | 25 | 32 | 39 | 46 | 53 | 60 | |
| 67 | 2 | 9 | 16 | 23 | 30 | 37 | 44 | 51 | 58 | |
| 65 | 72 | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | |
| 63 | 70 | 5 | 12 | 19 | 26 | 33 | 40 | 47 | 54 | |
| 61 | 68 | 3 | 10 | 17 | 24 | 31 | 38 | 45 | 52 | |
| 59 | 66 | | | | | | | | | |

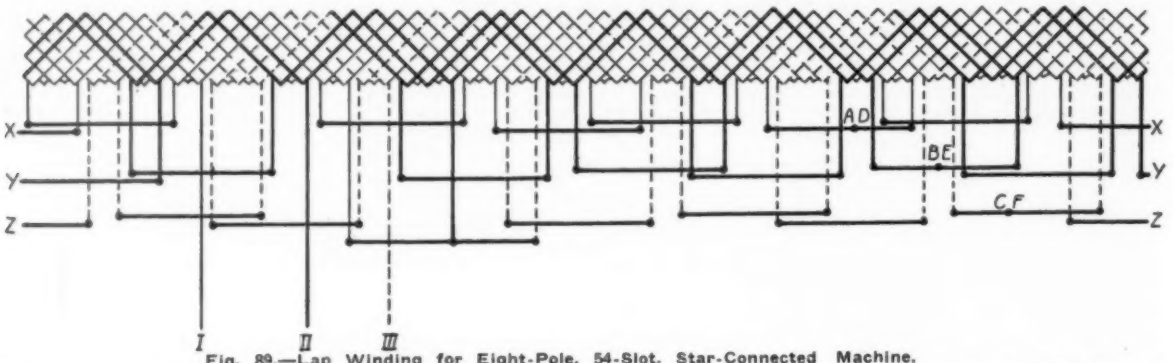
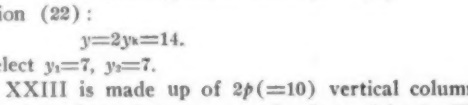



**Fig. 89.—Lap Winding for Eight-Pole, 54-Slot, Star-Connected Machine.**

To change to double-star connection, cut leads at *AD*, *BE*, *CF*, and connect *A* to *I*, *B* to *II*, *C* to *III*; short-circuit *D*; *E*; *F*.

To find the leads in Table XXIII we count 12 conductors, starting with conductor 1, and repeat this $2na=6$ times.

Fig. 85 gives the winding as indicated in Table XXIII and shows the 6 leads connected to a single-circuit star in line with Fig. 46, redrawn in Fig. 86. Fig. 86 can also be conveniently put in the preceding tabular form.




Noting in Fig. 85 arrangement of the coils belonging to different poles and phases, we find the grouping shown in Table XXIV. It is clear that we can connect the coils belonging to phase I, for example, all in series, making the end conductors lap, and we would obtain the same result as by making the connections shown in Fig. 85. We could make a double-circuit lap winding by connecting the coils in phase I under poles 1 to 5 in parallel to the coils of the same phase under poles 6 to 10, etc.

TABLE XXIV.

| Poles | Phases I | II | III |
|---|---|---|---|
| 1 | 2 | 1 | 1 |
| 2 | 1 | 1 | 2 |
| 3 | 1 | 1 | 1 |
| 4 | 1 | 2 | 1 |
| 5 | 1 | 1 | 1 |
| 6 | 2 | 1 | 1 |
| 7 | 1 | 1 | 2 |
| 8 | 1 | 1 | 1 |
| 9 | 1 | 2 | 1 |
| 10 | 1 | 1 | 1 |

If the number of slots is such that equations (23) and (24) are filled, the coils or conductors can be connected to a single-circuit or double-circuit polyphase winding. In case the winding is to be single-circuit open winding, equation (24) can be modified to read:

$$Z=\text{any whole number}\times na \quad \ldots\ldots(26)$$

Equations (23) and (26) can be expressed in words as follows. The number of slots must be by $a$ more or less than the number of pole pairs and at the same time divisible by $na$. For a simplex wave winding, the number of slots should be one more or less than the number of pole pairs and at the same time divisible by three for a three-phase winding, or by two for a quarter-phase winding.

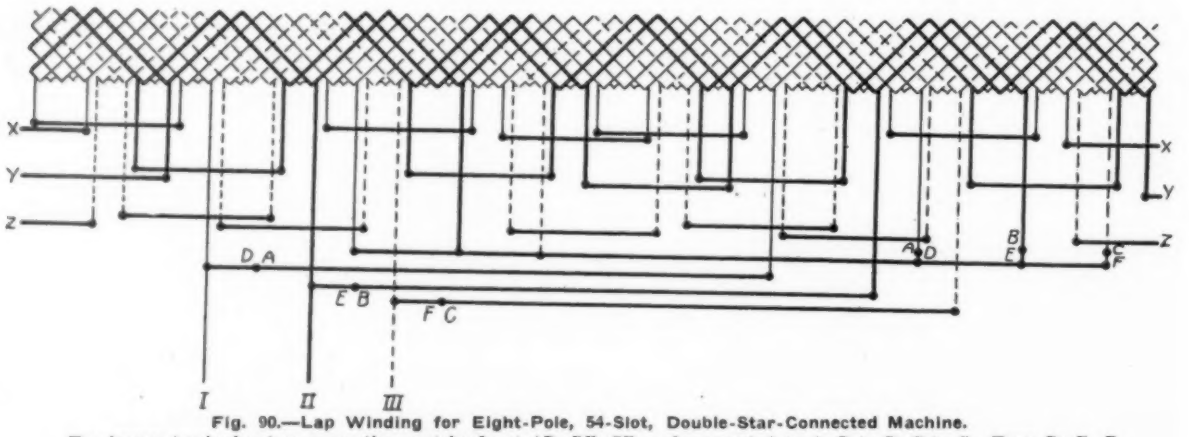



**Fig. 90.—Lap Winding for Eight-Pole, 54-Slot, Double-Star-Connected Machine.**

To change to single-star connection, cut leads at *AD*, *BE*, *CF*, and connect *A* to *A*, *B* to *B*, *C* to *C*. Tape *D*; *E*; *F*.

**Example No. 29.**

A four-pole machine has 27 slots, 27 coils and it is proposed to wind it wave, three-phase, single-circuit delta.

We have $Z=27$, $p=2$, $a=1$, $S=54$.

Equation (23): $27=2\times13+1=p\times13+a$

Equation (24): $27=2\times3\times1\times$ whole number $=2\times n\times a\times$ whole number, is not fulfilled.

Equation (26): $27=3\times1\times9=na$ 9, is fulfilled.

If we would divide the conductors in six equal groups we would have $S/6=54/6=9$ conductors in each section and it would be necessary when connecting up the various groups, to make connections from the front to rear part of the machine in a bar winding. If the coils are form-wound or consist of more turns per coil, it is not possible to use an odd number of coil sides in each section. We can use the following scheme. Instead of putting in each section nine conductors, we will put in the first section 8, in the second section 10, the third 8 and so on. This is done in Table XXV.

Equation (25): $y_k=(27\pm1)/2=14$.

Equation (22): $y=2y_k$. We select $y_1=15$, $y_2=13$.

TABLE XXV.

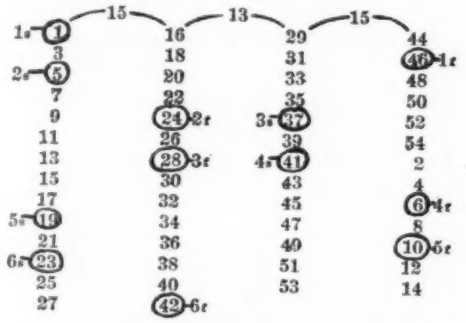



Fig. 87 is a layout of the winding as indicated in Table XXV and shows the six leads connected to a single-circuit star

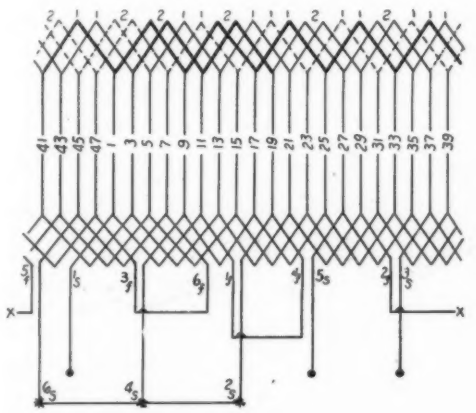
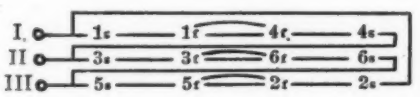


Fig. 91.

in line with Fig. 46, for convenience put in the form of the following table:




Noting in Fig. 87 the arrangement of the coils belonging to different poles and phases, we find the grouping shown in Table XXVI and we can obtain the same result as from Fig. 87 by connecting the coils as shown in Table XXVI and making the end-connectors lap instead of wave.

TABLE XXVI.

| Poles | Phases. I | II | III |
|---|---|---|---|
| 1 | 3 | 2 | 2 |
| 2 | 2 | 3 | 2 |
| 3 | 2 | 2 | 3 |
| 4 | 2 | 2 | 2 |

**Example No. 30.**

An eight-pole machine has 54 slots, 54 coils, and it is proposed to wind it wave, three-phase, single-circuit star.

We have $Z=54$, $S=108$, $p=4$, $n=3$.

Equation (23): $54=4\times13+2=p\times13+a=Z$.

Equation (24): $54=2\times3\times2\times$whole number$=2na\times$whole number, is not fulfilled.

Equation (26): $54=3\times2\times9=naq$, is fulfilled. We have to divide the conductors into $6a=12$ sections and we would have in each section $S/12=108/12=9$ conductors. Since the number of conductors per section is odd, we will adopt the same plan as in the previous example. This is done in Table XXVII.

Equation (25): $y_k=(54\pm2)/4=13$, $y_1=13$, $y_2=13$.

TABLE XXVII.

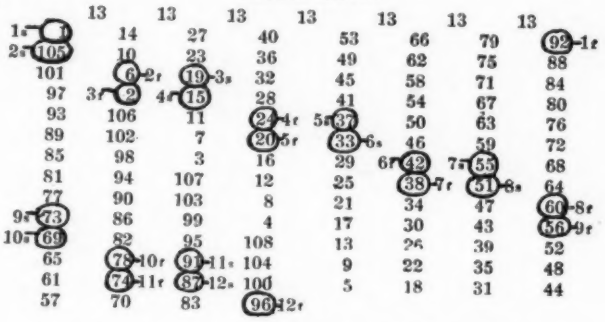



Fig. 88 shows the arrangement of the coils around the iron core as found by means of Table XXVII. The grouping shown in Fig. 88 is given again in Table XXVIII, which can be used for connecting up the coils to a lap winding of unequal number of coils per pole and phase under the different

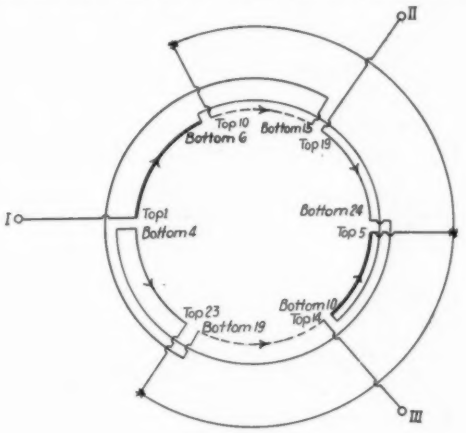



Fig. 92.

poles. This has been done in Fig. 89. It can be seen from Table XXVIII that the arrangement of coils repeats itself after half the number of poles, and the two halves of the winding can be placed in parallel. This has been done in Fig. 90.

TABLE XXVIII.

| Poles. | Phases. I | II | III |
|---|---|---|---|
| 1 | 3 | 2 | 2 |
| 2 | 2 | 3 | 2 |
| 3 | 2 | 2 | 3 |
| 4 | 2 | 2 | 2 |
| 5 | 3 | 2 | 2 |
| 6 | 2 | 3 | 2 |
| 7 | 2 | 2 | 3 |
| 8 | 2 | 2 | 2 |

According to equation (23), in order to obtain a balanced polyphase winding, the number of slots must be by $a$ more or less than a multiple of the pole pairs ($p$). At the same time the number of slots must, according to equation (26), be a multiple of $na$ where $n=3$ for three-phase and $n=2$ for quarter-phase winding. These two conditions can evidently not be fulfilled simultaneously when $n$ and $p$ have a common multiple.

The following artifice can be resorted to in such cases. Use as basis for drawing up the winding table a slightly smaller number of slots than the core actually has and insert the extra

coils after the diagram is finished. The winding table automatically takes care of this.

**Example No. 31.**

A six-pole machine has 24 slots, 24 coils and it is proposed to make a three-phase, wave, single-circuit star winding.

We have $Z=24$, $S=48$, $p=3$, $n=3$.

Since both the number of slots and the number of pole pairs are a multiple of three, we cannot simultaneously fulfill equations (23) and (24) or (26). We will use as slots in equation (23) a lower number of slots. Making the number of slots in equation (23) equal to 23, we have:

Equation (23): $23=3\times8-1=p\times8-a=Z$.

Equation (24): $24=2\times3\times1\times4=2na\times$whole number.

Equation (25): $y_2=(23+1)/3=24/3=8$. $y_1=9$. $y_2=7$.

The number of conductors in each of the $2na=6$ sections will be equal to $S/2na=48/6=8$.

Table XXIX represents the above winding and is drawn in the usual manner. The ensuing six leads can be connected to a single or double-circuit star or delta in the usual manner. Fig. 91 shows the winding diagram as given by Table XXIX. The arrangement of the coils is given in Table XXX and could be used for connecting the coils to lap winding. There are 8 special connectors having a throw of 9 conductors in front in place of 7; they are from 42 to 3, etc., and can be found in the last vertical column to the right in Table XXIX.

TABLE XXIX.

| 9 | 7 | 9 | 7 | 9 | 7 |
|---|---|---|---|---|---|
| 1 1t 0 | 10 | 17 | 26 | 33 | 42 |
| 3 | 12 1t | 19 2t | 28 | 35 | 44 |
| 5 | 14 | 21 | 2t 30 | 3t 37 | 46 |
| 7 | 16 | 23 | 32 | 39 | 48 3t |
| 4t 9 | 18 | 25 | 34 | 41 | 2 |
| 11 | 4t 20 | 5t 27 | 36 | 43 | 4 |
| 13 | 22 | 29 | 38 5t | 6t 45 | 6 |
| 15 | 24 | 31 | 40 | 47 | 8 6t |

The instruction to the shop could be put in the following form: *Coil lies in slots* 1 *and* 5. *Bottom of slot* 5 *connects to top of slot* 9. *Connect as per diagram shown in Fig.* 92.

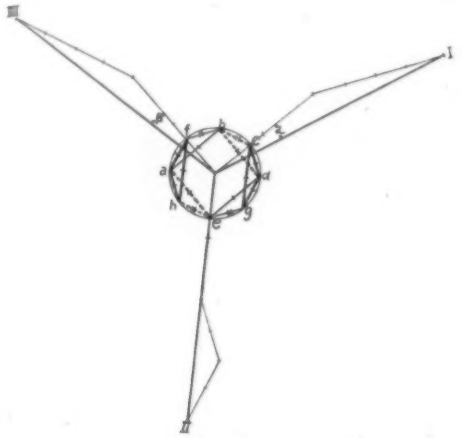


Fig. 93.

It is to be noted that the windings now under consideration are not perfectly balanced windings but can be considered as *practically* balanced windings. To show this the winding potential diagram has been drawn for Example 31 and is shown in Fig. 93. By measuring the resulting vectors it is found that the voltages stand in the ratio of 100 to 98.5 and the phases are displaced respectively by 113° 26′, 123° 17′ and 123° 17′ (electrical degrees.) Fig. 93 has been drawn as follows. The vectors *ab*, *bc*, etc., respectively, are drawn in the sequence shown in Table XXX. The dash on the vectors indicates the number of times the vector appears in the resultant. The vectors belonging to different phases are marked by a heavy line, a dotted line and a light line. Having 24 slots and six poles, the number of slots per pair of poles and the division of the circle will be 24/3=8. The resultant vectors, I, II, III, are found by adding up the individual vectors of each phase. The angle *f a b* corresponds to 22° 30′, and the vector I is made up as follows:

TABLE XXX.

| | Phases | | |
|---|---|---|---|
| Poles | I | II | III |
| 1 | ab 2 | bc 1 | cd 1 |
| 2 | de 2 | ea 2 | af 1 |
| 3 | fb 1 | bd 2 | dg 1 |
| 4 | ge 1 | eb 1 | bf 2 |
| 5 | fb 1 | be 1 | eg 2 |
| 6 | ge 1 | eb 1 | ba 1 |

$I=\sqrt{(4 \sin 22° 30')^2+(8 \cos 22° 30')^2}=7.55$

$\tan \alpha=4 \sin 22° 30'/8 \cos 22° 30'=1.532/7.392$ $\alpha=11° 43'$

III=I and $\tan \beta=\tan \alpha$

II=8 cos 22° 30′=7.39

Angle I—III=$90°+\alpha+\beta=90°+11° 43'+11° 43'=113° 26'$

Angle II—III=Angle I—II=135°—11° 43′=123° 17′

*(To be continued.)*

## Among the Contractors.

The Henry J. Rueff Company, Louisville, Ky., has obtained one of the largest fixture and wiring contracts recorded in Louisville for several years. The contract is for the work on the addition to the Tyler Hotel and amounts to $4,584.

The contract for installing the power and lighting system in the new plant of the Endicott Forging & Manufacturing Company, Endicott, N. Y., has been awarded to the Edward Joy Company, Syracuse, N. Y.

H. L. Lee, Jacksonville, Fla., has signed a contract with the Board of Port Commissioners for the electrical wiring of the municipal docks and terminals on Talleyrand Avenue, Jacksonville. The contract amounts to $4,460.

The Broderick-Bolte Electric Company, East St. Louis, Ill., has opened an automobile electric repair shop.

The Kopald Electric Company will open an establishment for handling electrical contracting and supplies in Berthold, N. D.

The Thomas Auto Repair Company, Kansas City, Mo., has moved to 1229 McGee Street, where larger facilities are available for electrical equipment repairs. O. L. Allen, for several years with the Delco Company, has charge of this department.

The United Electric Construction Company, Philadelphia, Pa., has been awarded a contract for electrical work in the new 14-story office building to be erected by Samuel L. Brumbaugh, on Walnut Street.

F. A. Clegg & Company, Louisville, Ky., have the contract for the installation of 14 motors in the new Western Union Telegraph Building. The installation of equipment has been delayed on account of inability to get deliveries.

The Topeka Electric Company, Topeka, Kans., has received the contract for wiring the Lux Building, the Lincoln Junior High School building, and new Holy Name Catholic School building, all in Topeka.

The Standard Electric Works, San Francisco, Cal., has the electrical contract for the new Santa Fe Building, Second and Market Streets, San Francisco.

S. Suiger & Company, electrical contractors, Brooklyn, N. Y., have moved their offices to 5005 New Utrecht Avenue, where additional facilities are provided for taking care of the company's increasing business.

# National Association of Electrical Inspectors

HUBERT S. WYNKOOP, President, 1574 Fiftieth Street, Brooklyn, N. Y.
WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

*Executive Committee*
J. C. FORSYTH, Chairman, 123 William Street, New York City.

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H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

### Secretary's Message.

The Secretary regrets very much that no material has been printed in these columns since the issue of July 1. He had hoped that there would be no break during the summer. It turned out, however, that he was directed to do no reading nor writing for a considerable period and it was not till well into August that the ban was lifted.

As soon as permitted a bulletin was printed which contained eight questions, of which the first two are printed herewith. This leaves six questions with their replies on hand and that is all. The members must come to his assistance now if the work is to continue, and if any of the sections have material of other kinds on hand it should be sent in.

There have been several names sent the Secretary as those of members not receiving the published matter. The Secretary was unable to attend to these for the above reasons, but the names have been sent in now and I think all should be on the list hereafter. The Secretary was not at home and was not so placed that correspondence could be handled by an assistant, but the summer has been spent far from either post office or any business appliances.

However, it has brought a complete recovery of health and from now on he will be found on the job. By the time this reaches the members his address will be as usual, Concord, Mass., and he can only repeat what he wrote in the recent bulletin to the Executive Committee: "Please do your best to help me and I promise to push things from now on. *Please send some questions and other material if possible, too.*"

The Secretary is particularly desirous to receive information from the members as to field experience favorable or otherwise with the iron parts now put in certain switches and similar appliances, and earnestly requests such be sent him.

**The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.**

**It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.**

**The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.**

### Grounding on Water Pipe.

**Question 331. Is this a Code violation? The neutral ground wire from an alternating current overhead service is attached to a vertical water pipe, seven feet from the floor. From this point the pipe runs under a four-inch concrete floor a distance of ten feet to the front building wall. The water meter is bonded round and placed in a brick pit three by three feet with a heavy tight-fitting cast-iron trap door.**

Answer 1 (K)*. Not in our opinion.

Answer 2 (V). As I understand the question, the Code would not be violated if the connection were between the service shut-off and street main.

Answer 3 (O). The construction described is not a direct violation of any Code requirement, but should be approved only if the ground can not be placed at the transformer and it is impracticable to run the individual service ground wire entirely on the outside of the building (Rules 15*b*, third paragraph and 15*e*).

Answer 4 (H)*. I should call this a very poor ground and should advise following Code requirements, going directly to the street side of the service cock. Certainly the proposed installation is not easily accessible.

Answer 5 (S)*. Yes. Rule 15*g*, first paragraph, states that the ground connection "may be made to water piping system running into buildings." The second paragraph tells us how this connection should be made. As outlined in the question, you have a good ground connection, but same does not comply with the Code requirements.

Answer 6 (B)*. The construction referred to would be a violation of Code requirements, rule 15*g*, relating to the grounding of low-potential circuits, plainly stating that ground connection should be connected on the street side of meters, main cocks, etc.

Answer 7 (P)*. Rule 15*g*, second paragraph, requires the attachment of the ground wire on the street side of the meter. The question presupposes that an exception to this rule should be granted because the pipe runs under a four-inch concrete floor before reaching the meter; that is to say, the pipe is presumed to be properly grounded. The rule itself is, however, very clear, and the work as described does not conform to it.

Answer 8 (N)*. While this construction is not in exact conformity to the rule, I have several cases at hand where I feel confident a somewhat similar plan has given better protection than a rigid following of the requirement. It is a case for the chief to consider in any special case requiring special treatment.

Answer 9 (E). While the method suggested in this ques-

tion for the grounding of a service wire does not entirely harmonize with the wording of the rule, we feel that the intent and purpose of the rule will have been served by such method. Surely no rule would insist on doing the impossible and our department has frequently approved of such forms of installation. In one instance, that of a college, the primary wires entered a transformer vault in one of the dormitory buildings. The main cock of the water system was in the boiler house, some 250 feet away. The water pipe, from the boiler house to the dormitory building, was in a brick tunnel. We suggested that the ground wire of the secondary system be attached to the water pipe, in the dormitory building, and the water meter in the boiler house be bonded from one side of the meter to the supply side of the main cock. We felt in this we were accomplishing the intent of the Code.

### Grounding of Underground Service Conduits.

**Question 332. Should Rule 12f, third paragraph, be construed to affect underground service conduits or not; if it should, then how should it be applied in the case of (1) an underground service conduit coming from a service pole? (2) an underground service conduit from an entirely underground distribution system?**

Answer 1 (K)*. No. Rules 15*f* and *g* take care of this.

Answer 2 (V). Rule 12*f* paragraph 3, applies to underground conduits, either from a pole or entire underground system.

Answer 3 (O). Rule 12*f*, third paragraph, refers to "metal conduits containing service wires" and therefore covers all service conduits no matter how they enter the building. This rule was intended to guard against overloading the interior conduit system or its ground wire in case of a failure of one of the outside service wires. A good plan, instead of attempting to insulate the service conduit from the service cabinet, is to ground the service conduit to the neutral wire through a jumper of No. 6 wire or larger. With this form of grounding, a failure in the service conduit completes a "dead short-circuit" and the interior system is not called on to carry a dangerous current.

Answer 4 (H)*. Underground service conduit coming from a service pole should usually be supplied with independent ground. Service conduit from an entirely underground distribution system is provided for by Rule 15*f*, which requires the entire underground system to be thoroughly grounded.

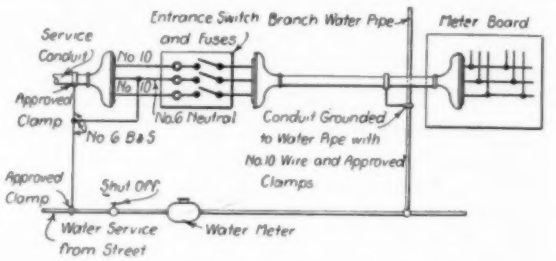
Answer 5 (S)*. Rule 12*f*, second paragraph, reads in part as follows: "The conduit to be equipped with an approved service-head." I am of the opinion, from the above paragraph, that Rule 12*f* was not intended for underground service conduits. In the case of an underground conduit coming from a service pole, I should recommend that it be grounded.

Answer 6 (B)*. In my opinion Rule 12*f*, third paragraph, was designed to cover services feeding from overhead construction and service conduit coming from a service pole, in both of which cases the conduit would not be properly grounded to take care of any trouble which might occur, due to a breakdown of insulation of conductors. It was not, in my opinion, designed to refer to service conduit from an entirely underground distribution system.

Answer 7 (P)*. Rule 12*f*, third paragraph, applies both to overhead and underground services, and it also applies to an overhead service which is carried from a pole line through a standpipe into the premises. It should be noted that where the metal of the conduit is or can be thoroughly insulated, an intentional ground is not required.

Answer 8 (N)*. In case (1) it applies. In case (2) I think it has no bearing whatever. The whole tenor of Rule 12 shows that it was written with overhead construction in view. The only index reference to underground work in the Code is to Rule 17. Further, look in the index under "Service Wires," "Overhead Rule 12," "Underground Rule 17." Further still, this appears to me only plain common sense.

Answer 9 (E). The paragraph referred to in both of the questions is for the installation of service wires in conduits,




**Standard Method of Grounding Service Wires.**

regardless of the fact that the service is from an underground system or an underground from an overhead line. In either event, according to my interpretation of the rule, the service conduit must be entirely insulated from the conduit, or other form of metal, system and all metal work within the building, or the service pipe must be effectually and permanently grounded, such ground being independent of the ground for the metal conduit or other metal systems in the building. Illustrative of the above I am sending an outline used by our department in connection with the provisions of Rule 12*f*, third paragraph (see illustration).

## Life of Power-Generating and Transmission Equipment.

The following estimates of life of property used in street-railway operation are contained in the order of the Public Service Commission of Massachusetts denying the petition for authority to increase fares on the entire Bay State Street Railway System from five to six-cent units, but granting the road the permission to raise its fares on the rural lines after formal application.

| Power Plant Equipment: | Years. |
|---|---|
| Boilers, water-tube | 25-30 |
| Boilers, fire-tube | 20 |
| Engines | 30-40 |
| Turbogenerators | 20 |
| Condensers | 20-25 |
| Pumps | 12-20 |
| Stokers | 15 |
| Heaters | 25-30 |
| Coal-handling machinery | 25 |
| Piping | 25 |
| D. C. Generators | 30-40 |
| Alternators | 25 |
| Switchboards — Average of generators. | |

| Distribution Equipment: | Years. |
|---|---|
| Iron poles | 40 |
| Cedar poles | 20 |
| Chestnut poles | 16 |
| Hard pine poles | 12 |
| Cross arms | 10 |
| Guys and anchors | 16 |
| Trolley | 2-30 |
| Overhead feeder | 25-30 |
| Underground cable | 30 |
| Submarine cable | 10 |
| Handthrow signals | 10 |
| Automatic signals | 14 |
| Signal wire | 15 |
| Submarine signal cable | 10 |
| Underground signal cable | 30 |

Telephone sets and cables correspond in life to above signal equipment.

## Group Insurance Plan Adopted by Boston Company.

Charles H. Tenney & Company, Boston, Mass., managers and engineers operating seventeen public utilities throughout the country, have arranged with a large life-insurance company for the insurance of its employees under the "group insurance" plan, whereby they may obtain life insurance at considerably reduced rates.

In case an employee leaves the employ of one of the Tenney companies, he is able to continue his insurance in his own name at standard rates without further physical examination.

# THE DEALER AND STOREKEEPER

**An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods**

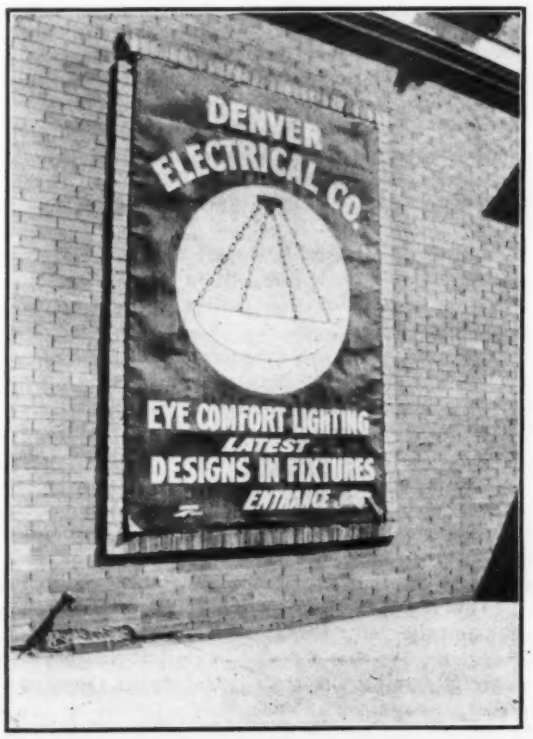
## DISPLAY ROOMS A FEATURE OF DENVER LIGHTING FIXTURE STORE.

**Appropriate Appointments and Careful Arrangement of Fixtures Results in Attractive Displays.**

The Denver Electrical Company has a very attractive electric fixture store at Fifteenth Street and Cleveland Place, Denver, Colo. This store shows what can be accomplished in the way of displaying electric-lighting fixtures when it is possible to have more than one showroom. The first room one enters on going into this store is the office. Here the routine office work of the company is transacted, while at the same time good use of the ceiling and walls are made in displaying different types of fixtures handled by the concern.

There are rooms opening from the office and are used in displaying all styles of electric-lighting fixtures for the home. In each of these demonstration rooms the home idea is adhered to as closely as possible. To bring this about carpets cover the floors, pictures hang on the walls, and the furnishings of the display rooms are of such a nature as to readily suggest the modern home of today.

Besides the office the Denver Electrical Company has five display rooms arranged in much the same manner as the one shown in the illustration. All are arranged in such a way as to make it possible to curtain off the light, and since all the fixtures are wired a customer can be shown during the day just how the fixtures will look when lighted at night.




**Utilizing Wall Space for Advertising.**

Another good point in the arrangement of the store is that the lighting fixtures displayed in the office and one of the main display rooms can be seen from the sidewalk. This in itself is a good advertisement.

At the present time the display rooms of the store are being redecorated and when finished each room will be different in order that they will harmonize with the fixtures shown in each and display them to better advantage.

Each electric-lighting fixture on display in the show rooms bears a tag and on this tag is plainly written the price. The store is kept very clean, the fixtures neatly arranged, and everything possible to create a cheerful surrounding is done, as this is considered a good aid in selling electric fixtures.

**Office and Showroom of Denver Electrical Company.**

On the outside of this store is quite a space of blank wall. This space was made use of by the Denver Electric company by putting up a large sign advertising the kind of a stock handled by the concern. The sign is painted in colors and is attractive. It contains few words, but those are enough to let the thousands of people passing the store daily know what the company deals in.

The Denver Electrical Company has not been in its present location much over a year, but during that time it has become known as a store where electric-lighting fixtures are attractively displayed; which is what people desire when they are in the market for fixtures to put in their homes and places of business.

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## Self-Lighted Electrical Window Display.

Messrs. Duncan & Goodell Company, hardware and cutlery dealers at Worcester, Mass., are featuring the "Old Sol" automobile lights and projectors in a fine window display which is self-illuminated. A handsome exhibit of these lamps and of smaller electric pocket and hand flashlights is arranged in the window on maroon-colored velours, and two units are attached to a frame at the outer corners of the window, deflected inward. These lamps are connected through a transformer with the 110-volt lighting circuit, giving eight volts, and are lighted at night.

# Some Merchandising Views of Denver Dealers

## Interviews with a Number of Dealers in Colorado City Bring Out Pertinent Points in Regard to Gaining Success in Conducting a Lighting-Fixture Business—Suggestions of Value to Dealers in Other Cities

THE men in charge of the electrical fixture stores of Denver, Colo., are of the opinion that the business they are engaged in is a growing one and that it should make even more rapid strides in the future. The electrical fixture business is young and people are just beginning to take real interest in the way their homes and places of business are lighted. The problem of obtaining lighting fixtures that harmonize with the other decorations in the home is one that now comes in for a great deal of study. Not so very long ago people were satisfied if a home was well lighted, and retailers did not offer any objections, as far as illumination was concerned, provided the light was sufficiently strong to enable customers to see goods when displayed at night.

**THE electric-lighting fixtures business has progressed so rapidly in the last few years that de lers must utilize all their powers in keeping pace and in securing their share of the trade. The dealer faces many problems in turning over his stock. Competition is usually very keen. Prices must be maintained so a legitimate profit can be secured, and yet they must be low enough to be attractive to the customer. Overhead expense must be kept within limits determined by the amount of business done and the dealer's individual way of doing it. Customers must be satisfied, even at an occasional sacrifice of profit, in order that the dealer may maintain his reputation. These and similar problems are all included in a day's business.**

**The interviews presented in this article bring out points that a number of Denver fixture dealers consider the most essential for the successful conduct of their separate stores. The results of their experience, though in some instances appearing self-evident, are offered for the consideration of other dealers.**

Now, however, all this is changed. The ornamental element has entered. Not only must the lighting fixtures be ornamental but they must correspond with the rest of the interior decorations. Dealers realize this, and they know that if an electric-lighting fixture merchant is to secure trade and hold it he must show himself equal to the task of giving the people what they want. Therefore, in this connection it is up to the dealer to first arrange his fixtures in his store in a way that, according to his mind, will be best suited in displaying their value to prospective purchasers. Then he must know how to install those picked out in a way that will meet with the approval of those buying the fixtures. He must know how to advise his customers in all things pertaining to lighting fixtures. This knowledge only comes through study, observation and experience.

### Homelike Atmosphere in Store Appeals to Customers.

In connection with the foregoing remarks Clark Rider, proprietor of the Denver Electrical Company, Fifteenth Street and Cleveland Place, says: "People are just beginning to take a real interest in electric-lighting fixtures and it is the duty of the dealers to help that interest along. After one secures a well balanced stock of fixtures the next important move is a well appointed store—arranged so the stock of fixtures can be displayed to their best advantage. The display rooms of a fixture store should be arranged so that it will be possible to show customers just how the different lighting fixtures will look in their own homes. My present demonstration rooms are out of style insofar as decorations are concerned and I have already started the work of reconstructing them. I am doing this carrying out of my idea of making it possible for the people that come into my store to look at fixtures to get an idea as to how the same fixtures would look if they were in their own homes.

"This can be done by making the walls of the rooms different tints and having the other decorations unlike. The furnishings of the display rooms should consist of the same as is found in the modern home of today, pictures should be on the walls—in fact, the home element should prevail in all parts of the electrical fixture store. The arrangement of the rooms should not be allowed to remain the same too long, either. It should be changed often enough so it will not lose its attractiveness. The pictures on the walls should be taken down and new ones put up every so often. No detail, no matter how small, should be overlooked.

"I am arranging so that when a certain party wants a certain kind of fixture for his home I can fix up a certain room here in the store to resemble as nearly as possible the room in the home in which the fixture is to be used. Then when the customer calls at the store to inspect the fixture I can display it to a very good advantage."

Henry Cahn, manager of the Cahn-Forster Electric Company, of Denver, is of the opinion that one should not overstock on certain kinds of light fixtures as they are apt to go out of style. This is especially true of portable lamps.

### Store Should Be Lighted at Night.

W. E. Rice, who conducts an electric-lighting fixture store at 435 Fifteenth Street, Denver, is a firm believer in the fact that a dealer in fixtures should keep his store well lighted at night. Especially is this true if the interior of the store can be seen from the sidewalk. This is characteristic of the Rice store and the well lighted showroom is a very good advertisement to the concern because the interior is very attractive with the many lighting fixtures illuminated each evening.

If the interior is not in view from the sidewalk the windows of an electric fixture store should be well lighted because the public expects a store of this kind to be well illuminated no matter whether other stores are lighted or not.

### Be Careful in Buying Stock.

"In these days of keen competition you have to be careful in buying a stock of electric-lighting fixtures," says R. S. Willoughby, president of the Silver State Electric Company, of Denver. "There are some electric fixtures that we no longer handle. It does not pay, since the field is divided up among so many. The department stores and light and power companies all maintain lighting-fixture departments, and they are cutting in on the electric-lighting fixture dealer's field.

"A number of years ago we stopped handling electric table lamps for the simple reason that the department stores began to sell them, which divided the field up among so many that it did not pay us longer to handle them. There are electric-lighting fixtures, however, such as those for the ceiling, that it pays us to keep in stock.

"The situation is that a dealer in electric-lighting fixtures must carefully select his stock by studying the market as to present demands and anticipate the future."

The Silver State people put out a very attractive business card in the form of a four-page folder with leaves about

the same size as a common business card. The first page of this folder contains reading matter that would be found on their business card, while the two inside pages are taken up in telling about the business of the firm. The back of the folder is left blank.

### Making a Study of Railroad Rates.

Albert Sechrist, head of the Albert Sechrist Manufacturing Company, Denver, attributes a great share of the success of his business to an exhaustive study of the railroad rate problem and his endeavors to meet it. By working out a system of packing electric-lighting fixtures he has been able to secure a wide market and compete with manufacturers and dealers of fixtures in all parts of the country. Of course, the Sechrist company manufactures its own lighting fixtures and goes about it with a view of making them in such a way as to be taken apart in packing. This enables the packing of the article in different packages, which go at a cheaper railroad rate than they would if the fixture was packed in one piece. The dealer, however, cannot say just how his fixtures are to be manufactured as the Sechrist people do, but he can study his stock—how best to pack it—and the railroad rates. It will save him money if he is doing a business that covers a territory larger than the city in which his store is located.

One of the smaller details of the Sechrist policy of selling fixtures is showing customers a large leather-covered book in which are photographs of buildings and homes containing fixtures purchased at their store. This helps the purchaser in seeing how the electric-lighting fixtures sold by the Sechrist firm look in actual use. On each page opposite the photograph is a letter telling how the people in whose home or place of business the fixtures are in use like them. A book like this, while in itself a small matter, is a big aid in making sales.

### Paying Attention to Details.

In visiting the different electrical fixture stores of Denver the writer observed that the most successful dealers were those who gave just as much time and thought to the small, and seemingly unimportant, details as to those of great importance. Some of the less important details of the trade and which were brought to mind by observation while visiting the different stores are as follows:

A store dealing in electric-lighting fixtures must be kept clean and attractive. The stock in the store also must be kept free from dirt.

If an electric-fixture concern has a delivery wagon or automobile it should bear wording that will tell briefly what business it represents. The delivery wagon should have some feature that will make it easily recognized when a person sees it the second time, even though he is not close enough to read the name of the firm on it. This in itself is a big advertisement for any firm.

Above all, the dealer should hustle and seek business no matter how small a chance he may seem to have for securing it. The electric-lighting fixture dealers of Denver are of the opinion that the dealer that goes after the business the hardest and has the fixtures to satisfy the customer is the one that will eventually win out and secure his full share of the business.

This is a day of business competition and it is up to the dealer in fixtures, as well as other lines of business, to devise ways and means of bringing him business. He can do this by making a thorough study of his business as to the market, how to buy to meet the demand, how to handle his stock when he has it purchased, and many other points of like nature. The dealer watches what other dealers are doing, looking back and profiting by his own experiences, and in many other ways. It matters little how he learns, providing what he learns brings the desired result—a large and profitable trade.

## Modern and Large Stock of Lighting Fixtures, Well Exhibited, Feature of Chicago Store.

One of the largest lighting-fixture concerns in Chicago is the Englewood Chandelier Company, 6140 Cottage Grove Avenue. It was organized in 1907 and manufactures, deals in and installs electric-lighting fixtures. Rapid business expansion has necessitated the company's removal to larger quarters several times, and in 1913 it erected the building it now occupies. The building is a two-story brick structure, 50 by 150 feet, with basement running the entire length, and is designed to meet all the requirements of the business and allow for future expansion. The front part of the first floor is used for showrooms and general offices. The assembling and shipping rooms are in the rear of the first floor and the factory and stockrooms are in the basement.

There are four showrooms on the main floor. The room at the front of the store contains samples of the higher priced fixtures and latest designs. Each succeeding showroom contains lower priced fixtures. This arrangement was made to save the customers' and the salesmen's time. The salesman endeavors to learn the kind and cost of the building in which the customer is to install the fixtures, and with this information is able to show in one room the fixtures suitable for the building. This saves the use-

Well Stocked Display Rooms of Chicago Fixture Store.

less task of showing the entire stock of fixtures, the major part of which would not be suitable. There are tables in each of the four rooms for the showing of portable lamps, and shelving and racks for showing shades of a large variety in style, color and price. In one of the rooms there is a large rack for displaying bowls and there is a portable lamp for illuminating any one of them. The side walls are used for exhibiting an extensive line of brackets. Each fixture can be illuminated separately.

The company considers each builder in Chicago, and especially those in the southern part of the city, a prospect. A circular letter is first sent to each prospect and if there is no response a second letter is sent, followed by a telephone or personal call. Every effort is made to bring customers to the store and to give them a good first impression of the establishment. When this, which is considered 50 per cent of the work of making a sale, is accomplished, courteous treatment and well appointed and stocked rooms usually succeed in producing the sale.

The company has been progressing very rapidly, due to its recognition of the factors that go to make up successful merchandising; a modern and large stock, well appointed showrooms, and service to its customers.

# NEW APPLIANCES

**A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances**

## Manufacturing Electrical Porcelain Under Modern Conditions.

For many forms of electrical equipment porcelain insulation, because of its mechanical and dielectric characteristics, is conceded to be the most adaptable and secure from hazard in its application.

The manufacture of electrical porcelain has been brought to a high degree of perfection in this country. The science and art of ceramics and pottery, as a matter of fact, for practical utilization for domestic and industrial purposes, has been advanced by American manufacturers far beyond the realization of most of the people utilizing these materials.

The manufacture of electrical porcelain requires a constant supply of proper ingredients, a thorough knowledge of manufacturing methods, a plant equipment for scientifically carrying out the various methods of manufacture, and a working organization trained to accomplish each element of the process involved in an intelligent and skillful manner.

A noteworthy example of present-day methods of manufacturing electrical porcelain is that of the Hartford Faience Company, whose plant is located at Hartford, Conn., on the lines of the New York, New Haven & Hartford Railroad. The accompanying general illustration of the plant presents a view from the north. This plant is equipped with nine kilns and produces electrical porcelain from tiny buttons to the largest molded forms. The plant is devoted entirely to the manufacture of electrical porcelain from the specifications of the builders of electrical equipment of every description.

Broadly speaking, the body of porcelain consists of purified kaolin, finely ground felspathic rock and quartz sand. The formula varies with the character of the product to be arrived at, and the quantitative admixture is the result of carefully worked out researches upon the part of the laboratory equipment of the manufacturer.

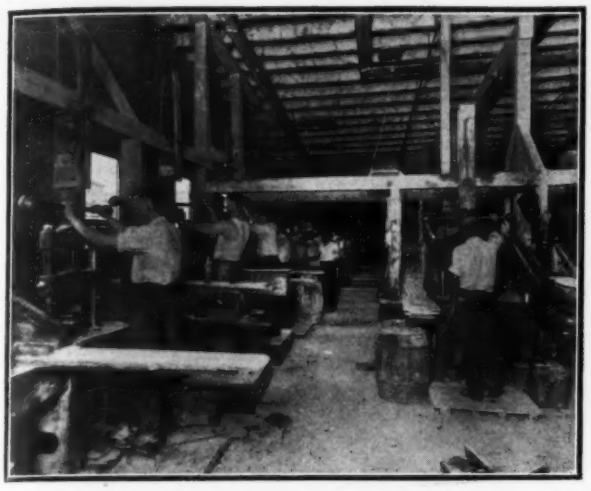
The ingredients of the porcelain body are mixed wet in a large plunger or tumbler, the contents being kept in constant motion by rotating arms. When thoroughly mixed this is called "slip" and is allowed to run by gravitation through a lawn or sieve (120 mesh to the inch) into an agitator which is a large receptacle placed below the surface of the floor. The agitator is also equipped with rotating arms, keeping the "slip" in constant motion. The "slip" is pumped from the agitator into filter presses which allow the water to filter through canvas bags but retain the clay. After being taken from the filter presses the clay cakes, are dried to a certain extent, then passed through a spider grinder and deposited in a dust box. The clay or body is then sieved and is ready for pressing. Great care must be exercised in the mixing of the body, as in the process of manufacture a shrinkage in size of approximately 12.5 per cent takes place. This is allowed for in the mold, but any deviation from the correct formula would cause a variation in the shrinkage that would be disastrous.

View in Slip House Where Ingredients Are Mixed.

The finely comminuted and partly dried clay is placed in a steel mold and pressed to correct size and form in a hand-screw press. The piece when pressed is forced from the mold by a bottom follower which is operated by a foot lever.

The ware after being pressed is placed in driers and when thoroughly dried goes to the cleaning and glazing

General View of Factory of Hartford Faience Company.



Pressing Department Where Clay is Molded.

Cleaning and Glazing Department.

department where the burrs or fins are cleaned off and the glaze is applied. The cleaning is done with a pencil of wood, or a special knife blade, and a glaze is applied by painting, dipping or spraying, according to the design of the piece. All of this work must necessarily be done by hand. After cleaning and glazing, the ware is ready for firing or baking and is placed on boards and put in racks at points conveniently reached by the kiln placers.

Hartford porcelain is made by the one-fire process—that is the ware is fired once only whether glazed or unglazed. Clay pots called "saggers" are filled with the ware to go into the kilns and these "saggers" are stacked up one upon the top of the other all around the sides and filling completely the kiln. When the kiln is filled the door is bricked up, immense metal bands are cemented into place, and the fires are lighted. These fires are served from six apertures around the periphery of the kiln. The fires are maintained until the temperature inside the kiln reaches approximately 2,550 degrees Fahrenheit, the time required for firing being about 32 to 40 hours.

All of this, by the way, must seem to be entirely mechanical. There is involved, however, in every part of the process an intelligent conception of the work being done, and skill and experience, the lack of which would render impossible the production of finished material fit to pass the rigid inspection required by these manufacturers. First of all, the ingredients must be correct; the composition must be absolutely as provided for in the formula; the time element involved in the mixing, and the proportions allowed with the narrow limits provided for shrinkage in the mold, call for the greatest attention to every individual detail.

In handling the clay or body as it is stuffed into the molds, then bringing the dies together with just the right amount of pressure, and then following up the release of this pressure with the ejector; the removal of this semi-plastic form from the molding press, and then the delicacy with which the fins or burrs must be removed, all call for workmanship above the average.

After the fins have been removed, the wares must still be very carefully handled, so as to result in no deformation, and assembled carefully in the "saggers" and then fired under conditions of uniformity calling for constant watchfulness in order that color and accuracy in size may be maintained.

Another important element in the production of high-class electrical porcelain is in the manufacture of the steel molds in which the porcelain is pressed. This is one of the most important parts of the industry and is one of the foundations upon which depends the accuracy in dimensions of the finished product. The Hartford molds are made by skilled mechanics.

The accompanying illustrations are reproduced from views taken in the plant of the Hartford Faience Company, and will give the reader a fairly good idea of the mechanical processes involved and the provision the company has made to skillfully carry out these various processes.

Section of Kiln Room.

Machine Shop for Die or Mold Building.

## Convenient Reflector Lamp for Garage Use.

Every motorist finds that the best place to make a general inspection of his car with the various adjustments and minor repairs frequently required is in the garage where proper facilities are at hand. When working on the underside or

New Garage Reflector.

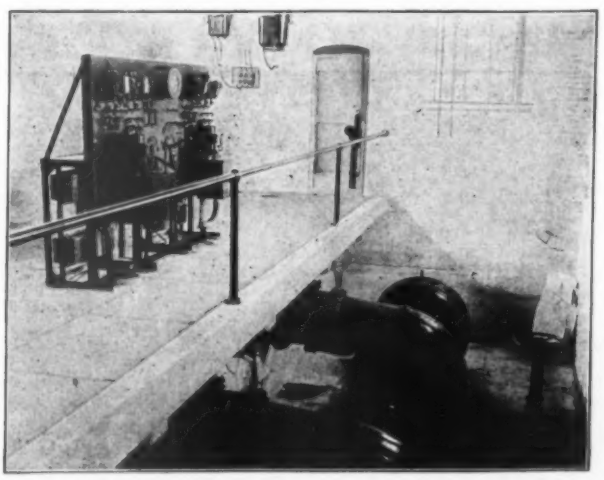
interior of the car it is necessary to have a strong light available that can be readily directed where needed.

A practical motorist has developed a reflecting lamp that provides such a light. As shown in the accompanying illustration, it consists of a spun-steel reflector securely attached to a sturdy socket and an adjustable spring stand that permits placing the outfit on the floor and directing the light right to the place where work is being done on the bottom of the chassis or other place that can ordinarily be illuminated only imperfectly and with difficulty. The outfit is provided with 15 feet of cord and a good plug for attaching to any convenient lighting outlet. The socket itself serves as a handle in trouble hunting. Any medium-base lamp can be used, but a 60-watt Mazda lamp has proved the best.

This handy and powerful outfit is known as the Alvolite. It is manufactured by the A-A Electric Manufacturing Company, Bridgeport, Conn.

## Idaho Reclamation Pumping Station Automatically Operated.

An interesting automatic-control installation is in operation in the West End pumping station of the Minidoka

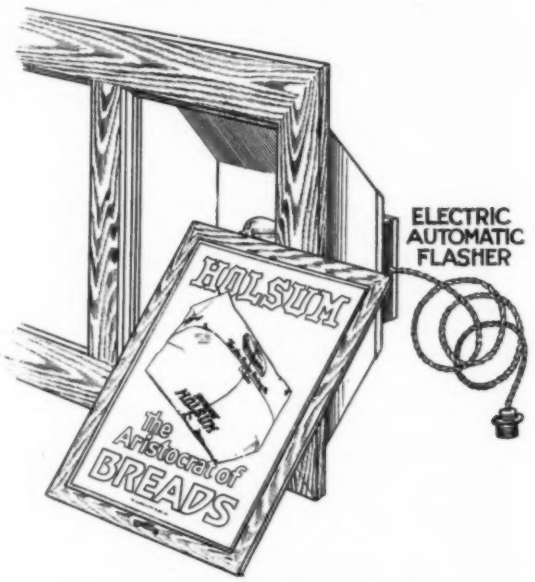


Cutler-Hammer Automatic-Control Panel Installed in Pumping Station.

reclamation project in Idaho. The equipment consists of two 75-horsepower Allis-Chalmers 2,200-volt motors, two centrifugal pumps and automatic-control apparatus installed by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Water is pumped by this station to a height of 21 feet above a gravity canal which irrigates 2,200 acres of land forming part of the Minidoka project. The station is operated without regular attention other than that given it by a ditch rider who sleeps in a room in the station at night. The control apparatus mentioned above automatically starts and stops the motors and in case there is an interruption of power it is so designed as to bring the pumps back into service without any supervision. The pumps are located in a pit with the runners below the surface of the water in the intake canal and therefore are always primed.

## The Gritt System of Changeable Signs and Plan of Co-operative Use.

The Southwest Retailers' Advertising Corporation, with headquarters in the Ridge Building, Kansas City, Mo., an organization composed of retail merchants for the purpose of co-operating with manufacturers of food products in connection with their local and national advertising campaigns, has adopted the Gritt electrical fixture, a patented interchangeable electrically illuminated advertising sign.




Gritt Changeable Electric Sign System.

The fixture has seven separate compartments or sections, each section operated with an individual flasher and illuminated with a 20-watt Mazda lamp.

The advertisements are photographic, hand-colored, transparent plates, 10 by 14 inches. Merchandise trademarks or packages are reproduced in original colors on these plates or slides. The various transparent colors with the electrically illuminated flash arrangement give a very attractive display, that has been found especially effective in groceries, meat markets, delicacy establishments, etc.

One Gritt fixture is furnished to each member of the Southwest Retailers' Advertising Corporation, which has over 1,000 members to date.

Local electrical contractors in each city are given the exclusive contracts to look after the installation and repair work of all the fixtures installed. These contracts run for five years and the electrical contractor is paid a fixed amount for each installation and a certain amount per month for looking after the repairs and slide changes and inspecting the fixtures, depending on the number furnished in the locality.

## Improved Large-Capacity Tank-Type Oil Circuit-Breakers.

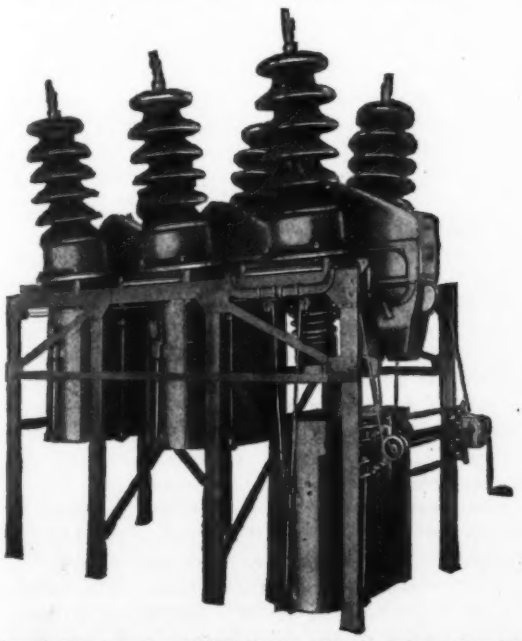
The main changes that have been made recently in tank-type oil-break circuit-breakers have been introduced to make the breakers more accessible for inspection and repair. No radical departure in the design of the current-carrying or operating parts has been necessary.

The forms of breakers here shown cover the General Electric Company's complete line of high-voltage, large-capacity tank-type circuit-breakers for both indoor and outdoor use, with the exception of a few for indoor service only. Indoor and outdoor breakers are practically similar. The only difference consists of the addition to the indoor breaker of a few parts to enable it to be serviceable both from a mechanical and an electrical standpoint under all weather conditions.

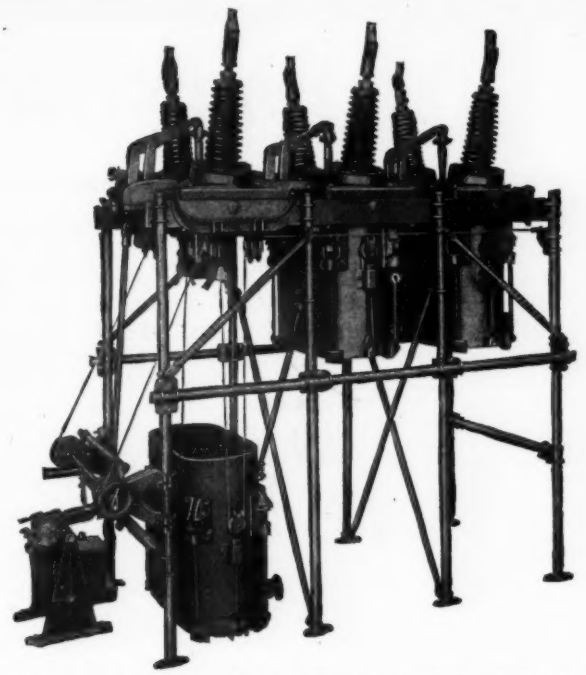
The forms K-21 and K-26 oil circuit-breakers are used indoors on voltages of from 35,000 to 150,000, and the K-22 and KO-26 are used on outdoor work from 22,000 up to 150,000 volts. The K-22 is like the K-21, except that it has outdoor bushings and the mechanism is protected from the weather by an iron housing. The KO-26 is like the K-26, except weatherproof covers and outdoor bushings.

A noteworthy advance in the breakers consists of mounting them on framework and in the handling of the tanks by a tank-lifting device recently perfected. The lifter consists of a detachable frame with shaft, handle, worm gear and winding and unwinding drums. The advantage of this equipment is that it allows a tank to be removed or placed in position without difficulty. The device is readily detached and can be moved by one man from one switch to another, thus making it a very simple operation to lower or raise an oil tank, and also making it easy to aline and inspect contacts and oil, and replace contacts if necessary.

These top-connected circuit-breakers are self-contained for use on systems of potentials up to and including 200,000 volts. One tank with two breaks in series is used in each phase. The breakers are made for either automatic or non-automatic operation. They are closed by hand, solenoid or air, and the automatic breakers are tripped under overload by series trip coils (mechanical trip indoor only) or current transformers. In using these circuit-breakers for hand operation, they can be installed behind the switchboard panel with the operating handle in front and connected to the breakers by connecting rods and bell cranks. All the breakers can be mounted on a framework, except those for 110,000 volts and above. All the breakers can also be operated by a removable wooden lever connected directly to the mechanism. When solenoid or air-operated, the breakers may be located where desired and controlled from the switchboard or other convenient place by a pull control switch or air valve.



Oil Circuit-Breaker for 70,000 Volts, 300 Amperes, Mounted on Steel Framework With Tank Lifter.



Oil Circuit-Breaker for 35,000 Volts, 300 Amperes, Mounted on Pipe Framework With Tank Lifter.

The operating mechanism and bushings are secured to the cast-iron cover of the heavy sheet-steel tank. Each bushing extends through the switch cover into the oil, and is so clamped to the cover that the throwing of oil is impossible. The bushings are easily removable and interchangeable.

There are two fixed contacts in each switch element between which one phase of the circuit is made and broken by a horizontal contact blade. Each contact blade is connected to the operating mechanism by a specially tested hard wooden rod, which passes through the cover of the switch in an insulating bushing. The stationary contacts consist of widely flared fingers and long arcing tips of drop-forged copper secured to the contact block by flat steel springs, copper laminations and screws. The contacts are always smooth and bright due to the sliding effect they are subjected to on opening and closing and the arrangement of burning tips.

The oil tanks are constructed of sheet steel, and are of more than ample strength for the service required.

Before an oil circuit-breaker leaves the factory it is given a thorough high-potential test to make sure that it is up to the standard requirements. Each switch bushing is subjected to a high-voltage test at least equal to that prescribed in the standardization rules of the American Institute of Electrical Engineers, and wooden rods, relay trip rods, etc., which are of treated wood, are given a potential test of 100,000 volts for each ten inches of length.

The oil furnished for these breakers is known as G-E oil No. 6 and is especially adapted for this service, since it has a very high flashpoint and high resistance to carbonization. The insulating value of the oil and its burning and carbonizing characteristics make a difference in the length of time the arc will hold. Wherever the temperature goes below freezing. No. 19 oil is used.

# INDUSTRY ACTIVITIES

**Clarage Fan Company,** Kalamazoo, Mich., has issued catalog No. 5, on multiblade fans.

**Stow Manufacturing Company,** Binghamton, N. Y., has issued bulletin No. 100, on electric motors; bulletin No. 101, on electric tools, and bulletin 102, on flexible shafting.

**Dearborn Chemical Company,** McCormick Building, Chicago, Ill., has issued a booklet on "Incrustation, Corrosion, Foaming and Other Effects of Water Used in Steam Making, and Methods of Prevention."

**Leatheroid Manufacturing Company,** 43 West Sixteenth Street, New York, N. Y., is distributing a card to which is attached samples of different thicknesses of its product, which is used for electrical insulation.

**Westinghouse Church Kerr & Company,** engineers and constructors, 37 Wall Street, New York City, have issued a folder on the construction of a reinforced car barn for the British Columbia Electric Railway Company, Vancouver, B. C.

**Cooper Hewitt Electric Company,** Hoboken, N. J., has furnished a large number of mercury-vapor lamps for various shops and departments of the large shipbuilding plant recently established at Long Points, a suburb of Montreal, by Canadian Vickers, Limited. This is the first large plant of the kind in Canada, and is a branch of the well known firm of Vickers, Limited, of England. This firm is now using about 2,000 Cooper Hewitt lamps in its various plants, having found them peculiarly suitable for use in shops where very accurate work requiring high acuity of vision is performed.

**New England Butt Company,** Providence, R. I., manufacturer of braiding machines and insulated wire and cabling machinery, states that it has had more demand for machinery for electrical work than ever before and that this demand continues at the present time. The company has been obliged to refuse a number of orders because of inability to make deliveries required, and has been compelled to make numerous increases in prices because of the advanced cost of raw material and labor. One of the greatest difficulties has been to obtain a sufficient amount of labor. J. G. Aldrich, president of the company, expresses the opinion that present conditions will continue for some time to come, though qualifying it with doubt as to what the outcome would be if the European War should come to an end suddenly.

**Hughes Electric Heating Company,** 211 West Schiller Street, Chicago, Ill., has received a letter from a salesman in Corpus Christi, Tex., which illustrates the durability of the Hughes electric range. The following is quoted from the letter: "Mr. Dupre, of the Corpus Christi Railway & Light Company, has a Hughes range installed in a house that was completely demolished and blown away by the recent storm and hurricane which struck Corpus Christi, the stove being blown some 500 feet from where it was originally located. When the storm was over and the people could get another house, all they did to the stove was to rub the dirt and salt water from it, connect it up and go to work, not a piece or part being damaged in any way. As the writer was in that storm, and knows how bad it was, he has about come to the conclusion that the only successful way to break or damage a Hughes range would be to use an axe or a pile driver, and he is thoroughly convinced that nothing else will harm them."

**Westinghouse Electric & Manufacturing Company,** East Pittsburgh, Pa., is making 48 motors and all the other electrical equipment needed for eight new 1,500-horsepower single-phase locomotives for the Midi Railway in the southern part of France. The order came originally to the **French Westinghouse Company** but could not be filled on account of the crowded condition of its Havre shops. The motors are rated at 300 horsepower, 312 volts, 16⅔ cycles. The Midi Railway has been using single-phase locomotives since 1908 and obtains its electrical supply from several hydroelectric plants.

**Wirt Company,** Philadelphia, Pa., manufacturer of electric-lighting appliances, has inaugurated an eight months' national advertising campaign in some of the largest periodicals, the well known Dim-a-lite line of devices being featured. In addition to this national publicity, the trade is being offered, for distribution to customers, an entirely new set of three-color lithographed descriptive leaflets, various window display material and a new type of Dim-a-lite demonstrating machine. This is the third successive year of national advertising by the Wirt Company in its endeavor to completely co-operate with the electrical dealer.

**New Factory Building Completed for Robbins & Myers Company.**—The addition to the factory of the Robbins & Myers Company, Springfield, O., which was started early in 1916, was completed September 1. The equipment is now being installed and a part of it is in operation. The new building is of the same construction as the older building, being of concrete with steel window sashes and wood floors. It is 62 feet in width, 436 feet in length and has five floors, giving a total floor space of about 135,000 square feet. With the completion of this building, ground has been broken for another building which will be erected immediately adjoining the building just completed.

**Construction of Heating Units for Globe Electric Ranges.**—In the construction of a heating unit for an electric range one of the points to be carefully guarded against is the liability of burnouts. Because of the inconvenience given the consumer when a unit is out of use by reason of burnouts, the various manufacturers have taken extra precautions to eliminate any such possibility. The method employed in the construction of the units for Globe electric ranges, manufactured by the Globe Stove & Range Company, of Kokomo, Ind., consists really of two parts, and is said to be very effective. In the first place, the wire in the units is heavier than that found in units of many other stoves. This provides a more dependable resistance coil—more suitable to withstand the high temperature of cooking service. In constructing the unit, wire of a maximum size has been used, which would still permit of itself being coiled in the given space with the individual coils far enough apart to give satisfactory service. If a size and length of wire is used which necessitates the small coils lying close together there is a tendency for them to bunch or creep together under continued service. At these various points the coils will then operate at white heat and a burnout in the unit results. The use of as large a size of wire as possible and at the same time keeping the small individual coils of the unit a sufficient distance apart is said to be one of the chief factors in the success of the present Globe heating unit.

# PERSONAL AND BIOGRAPHICAL

MR. PETER JUNKERSFELD, who was elected president of the Association of Edison Illuminating Companies at its thirty-seventh annual convention, held at Hot Springs, Va., September 4-7, is assistant to the vice-president of the Commonwealth Edison Company, Chicago, Ill. Mr. Junkersfeld was graduated from the University of Illinois in 1895, after which he joined the operating staff of the old Chicago Edison Company. In 1906 he was advanced to the position of electrical engineer for the company, and in 1909 was appointed to his present position, which involves large responsibilities in connection with the company's extensive engineering work. Mr. Junkersfeld is a fellow and a vice-president of the American Institute of Electrical Engineers, a member of the National Elec-

Peter Junkersfeld.

tric Light Association, the American Society of Mechanical Engineers, the Western Society of Engineers and other engineering organizations, in which he has been prominent for his activities.

MR. B. E. JACK, formerly new-business manager of the Salina (Kans.) Light, Power & Gas Company, has accepted a similar position with the United Water, Gas & Light Company, of Hutchinson, Kans.

MR. F. B. H. PAINE has become associated with MR. WILLIAM McCLELLAN and MR. HORACE T. CAMPION to form the firm of Paine, McClellan & Campion, consulting engineers, with offices at 25 Church Street, New York, N. Y., and 1420 Chestnut Street, Philadelphia, Pa.

MR. J. V. MURDAUGH, commercial manager of the Union Gas & Electric Company, Bloomington, Ill., for the past two years, and prior to that connected with the commercial department of the Little Rock (Ark.) Railway & Electric Company, has been appointed commercial manager of the Colorado Springs (Colo.) Light, Heat & Power Company. MR. J. C. NICHOLS, formerly of the commercial department of the Elmira (N. Y.) Water, Light & Railroad Company, has succeeded Mr. Murdaugh at Bloomington.

MR. ARTHUR H. ROBBINS has resigned as electrician for the National Fireworks Manufacturing Company to accept a position as instructor in electricity in the department of manual arts, Boston (Mass.) public schools.

MR. W. F. PFENNIG, accountant for the Stone & Webster Management Association, has been transferred to the main office in Boston, Mass., after being connected with the Houston (Tex.) Electric Company for 10 years.

MR. L. W. JACKSON has been appointed acting manager of the Alabama Power Company in Anniston, Ala., succeeding MR. A. L KENYON, who will resign October 1. Mr. Jackson has been the company's auditor in Anniston for several years.

MR. JOHN VAN OUWERKERK, formerly secretary and treasurer of the Falls Light & Power Company, Sheboygan Falls, Wis., has resigned to accept a position as superintendent and manager of the municipal electric-lighting plant in Sheboygan Falls.

MR. GEORGE G. BADER, for the past two years president of the Electric Garage Company, Louisville, Ky., has resigned, and has disposed of his interest in that company. He contemplates the establishment of an electric garage in the central part of that city.

MR. JAMES J. FLINT, president of the Flint Electric & Manufacturing Company, Denver, Colo., narrowly escaped death recently when his automobile turned turtle near Buttes, Colo. Mr. and Mrs. Flint were thrown clear of the car and were stunned for a few moments, but fortunately escaped with a few minor injuries.

MR. C. R. DUNCAN, who has been manager of the Ventura County Power Company's office in Oxnard, Cal., has been transferred to the management of the office of the producing plant of the Pacific Light & Power Company at Big Creek, near Fresno. MR. C. V. KENNEDY, who has been with the Los Angeles office of the Pacific company, has been transferred to Oxnard.

MR. J. P. PHILLIPS, vice-president of the Chillicothe (O.) Electric Railroad, Light & Power Company, has been elected president of the Ohio Utilities Company, recently incorporated to consolidate the Circleville Light & Power Company, the Gallipolis Electric & Power Company, the Delaware Electric Light, Heat & Power Company and the Chillicothe Electric Railroad, Light & Power Company.

MR. HOWARD M. GASSMAN, chief electrical engineer for the Tennessee Coal, Iron & Railroad Company for the past eight years, tendered his resignation, effective September 1, and has opened offices in the Brown-Marx Building, Birmingham, Ala., and will devote his time to electrical and mechanical engineering, as applied to mining and manufacturing plants. Mr. Gassman is a graduate of Johns Hopkins and Lehigh Universities, and has been engaged in engineering work 16 years.

MR. GEORGE B. TRIPP, the newly elected president of the Pennsylvania Electric Association, is vice-president in charge of the operation of northern properties of the United Gas & Electric Engineering Corporation, New York City. Mr. Tripp was born in Scranton, Pa., in 1871, and was educated in the schools of Scranton and Philadelphia and the School of Lackawanna at Scranton. He began his electrical career in the shops of the Weightman Electric Company, Scranton, and in 1891 became connected with the engineering department of the Edison General Electric Company, of New York. In 1894 he was employed as engineer with the Howard Electric Company, of New York, and assisted in the

G. B. Tripp.

development of the long-burning inclosed arc lamp. Since that time Mr. Tripp has been engaged in central-station work, serving in various capacities with the Cleveland Electric Illuminating Company; general manager of the Colorado Springs Electric Company, and as an official of the Central Colorado Power Company, the Leadville Light & Power Company, and the Las Animas Electric Company. In 1911 he resigned as general manager of the Colorado companies to accept the management of the Harrisburg (Pa.) Light & Power Company, and in 1914 he was appointed to his present position. He was a member of a number of civic and business organizations in Colorado, and at one time was president of the Colorado Electric Light, Power and Railway Association. His activities in Harrisburg included active membership in civic organizations there, and during his management of the company he carried out the reconstruction of the power plants, and developed the ornamental street-lighting system and a model underground distribution system. Mr. Tripp is an associate in the American Institute of Electrical Engineers. a member of the National Electric Light Association and numerous other engineering associations, both of local and national character.

# CURRENT ELECTRICAL NEWS

## Weekly Record of Construction Activities

### EASTERN STATES.

KITTERY, ME.—A hearing was held here recently by the Public Utilities Commission to get facts about a proposal to lease the Kittery Electric Company to the Rockingham County Light & Power Company of Portsmouth, N. H. The decision was reserved.

ATHOL, MASS.—Improved street lighting will be inaugurated on Exchange Street, consisting of 1,000-candlepower nitrogen-filled lamps, interspersed with units of small candlepower. The larger lamps will be burned until 11 p. m., when they will be switched off and the smaller ones burned during the remainder of the night.

CANAAN, MASS.—The Canaan Electric Light & Power Company, F. W. Munch, manager, has completed a transmission line from West Stockbridge to this city and is now extending the line to the Berkshire industrial farm, where a lighting load will be secured. Energy is purchased from the Glendale (Mass.) Electric Company.

GREAT BARRINGTON, MASS.—The Great Barrington Electric Light Company is planning to erect a new power plant on the east bank of the Housatonic River directly opposite the present plant. The new plant will contain two 150-kilowatt generators driven by water turbines. The building is being erected by the Fish-Carter Construction Company, and Charles T. Main is the engineer. When completed, the plant will be used as the main power plant of the company and the present plant will be used for emergency purposes.

NEWBURYPORT, MASS.—The extension to the station of the Newburyport Gas & Electric Company is nearing completion and machinery will soon be installed.

WESTFIELD, MASS.—A committee of three has been appointed to investigate the municipal gas and electric department. Engineering assistance from outside may be employed. It is reported that a number of individuals stand ready to form a company to take over the plant, but the majority of the citizens wish to retain it as a municipal undertaking.

WINCHENDON, MASS.—The Winchendon Electric Light & Power Company will make extensive alterations and additions to its generating station. The company, now controlled by C. D. Parker & Company, Boston, will develop the water privilege formerly owned by B. D. Whitney & Son. A large brick station will be built, and two direct-connected turbo-generators will be installed. Offices and stockrooms are being moved to the Burt Block, on Central Street.

PAWTUCKET, R. I.—The Blackstone Valley Gas & Electric Company will construct a power line to serve Diamond Hill, Arnold's Mill and Grant's Mill. It is expected that factories now operated by gas and steam engines will be run by electric power and that sawmills and farming activities will be motorized. The lighting of the highways will be considered by the town officials.

PROVIDENCE, R. I.—The enlargement of the power plant of mill No. 5 of the Wanskuck Company will be undertaken at once, two one-story additions, one 24 by 40 feet, and the other 52 by 122 feet, to be erected. C. R. Makepeace & Company, of this city, are the architects.

LONG ISLAND CITY, N. Y.—The Pennsylvania Railroad Company has ordered a 20,000-kilowatt, 11,000-volt, 25-cycle turbine unit complete, with a 24,000 square-foot surface condenser and auxiliaries, from the Westinghouse Electric & Manufacturing Company for installation in the railroad company's Long Island City power house, which supplies energy for the operation of the Pennsylvania Terminal and the Long Island Railroad.

PITTSBURGH, PA.—The Duquesne Light Company is erecting a 66,000-volt transmission line to the Beaver Valley.

SCRANTON, PA.—The Scranton Electric Company, of which D. T. Campbell is vice-president and general manager, will extend its transmission line to Waymart and furnish electric service there.

STROUDSBURG, PA.—James T. Rood, consulting engineer, Easton, Pa., has been retained by the Borough Councils of Stroudsburg and East Stroudsburg to prepare plans for new street-lighting systems in the two boroughs. The arc-lamp system will be replaced by incandescent lamps.

BALTIMORE, MD.—At a meeting of the State Board of Education a committee was appointed to investigate the establishment of an electric-lighting plant at the Normal School.

ATLANTA, GA.—The Atlanta & Anderson Construction Company, Electric & Gas Building, Atlanta, has been organized preliminary to building an electric interurban railway from Atlanta via Gainsville, Ga., to Anderson, S. C., about 115 miles. H. M. Atkinson, chairman of the Georgia Railway & Power Company, is interested in the company.

DAMASCUS, GA.—An election will be held this week to vote on the question of issuing $10,000 in bonds for the establishment of an electric-lighting plant and water-works system.

MILLEDGEVILLE, GA.—The Georgia Prison Commission, Atlanta, is considering the installation of an electric-lighting plant at the state farm here.

NEWBURN, GA.—Bonds in the sum of $3,000 have been voted for the installation of a street-lighting system here.

MACON, GA.—The City Council is considering plans for the construction of a municipal electric-lighting plant and has appointed a committee to investigate the matter.

McINTOSH, FLA.—A transmission line is being erected from Micanopy, Fla., to this place, a distance of seven miles, by the latter city, and electric service will be furnished here.

ST. AUGUSTINE, FLA.—The Jacksonville-St. Augustine Electrical Railway Company is planning to build an electric power plant. T. B. Osmond is manager.

ST. PETERSBURG, FLA.—C. E. Burleson, of this city, will make a survey for the proposed electric line of the Tampa & St. Petersburg Railway Company, from St. Petersburg to Tampa, about 18 miles. G. S. Gandy, of St. Petersburg, is president.

TARPON SPRINGS, FLA.—The Southern Utilities Company, of Jacksonville, will construct a white-way system here costing about $5,000.

### NORTH CENTRAL STATES.

CANAL FULTON, O.—The city is contemplating the installation of a modern boulevard lighting-system, and the Council is making investigations of several types of lamps and installation methods with a view to passing an ordinance covering the matter.

CINCINNATI, O.—The Union Gas & Electric Company has secured contracts in the form of franchises from the villages of North Bend, Cleves and Addyston under which it will furnish electrical energy for street lighting and private consumption. In Addyston the contract contemplates the installation of 50 street lamps of 80 candlepower. A considerable amount of construction is involved in the acceptance of the franchises.

EAST LIVERPOOL, O.—The City Council has passed an ordinance to issue bonds in the sum of $15,000 to cover the cost of employing a lighting expert to rearrange the street-lighting system.

MARTINS FERRY, O.—A recommendation has been made by Superintendent James Tush for changing of the local electric-lighting system from the arc lamps to tungsten lamps.

BREMEN, IND.—Plans are being considered for the changing of the city pumping plant from steam to electric drive.

DAYTON, IND.—The Mulberry (Ind.) Light & Power Company is planning to extend its transmission line to furnish electric service here.

HARTFORD CITY, IND.—Improvements costing in the neighborhood of $10,000 will be made at the Muncie Lighting Company's substation here.

TROY, IND.—The local electric-lighting plant has been purchased by J. C. Emmick.

CHRISTOPHER, ILL.—The Central Illinois Public Service Company, of Mattoon, has purchased the holdings of the Tyrone Electric Company, of this city.

MONTGOMERY, ILL.—The Montgomery Hydro Electric Company has retained H. A. Strauss, consulting engineer, Harris Trust Building, Chicago, Ill., in connection with the proposed hydroelectric development of the Fox River at this city.

MOUNT CARROLL, ILL.—The Peoples Gas & Electric Company, of Savanna, is planning to erect a high-tension transmission line to this city, about 12 miles.

SPRINGFIELD, ILL.—The subject of an ornamental street-lighting system to be installed in Monroe and Washington Streets and in Capitol Avenue was discussed at a conference of the City Council and the Board of Local Improvements. Preliminary plans indicate that the installation will necessitate the expenditure of considerable money.

WILMINGTON, ILL.—Ways and means for the installation of a new street-lighting system are being investigated by the City Council.

GRAND HAVEN, MICH.—The city is planning to erect a 6,600-volt transmission line, three miles long. I. R. Ellison is city manager.

SAGINAW, MICH.—The Consumers Power Company has asked the City Council for a 60-day extension of the time limit for installing the white-way system on Genesee Avenue and Court Street.

MILWAUKEE, WIS.—The Park Board has entered into a contract with the Milwaukee Electric Railway & Light Company for the illumination of Lake and South Shore Parks. By the provisions of the contract, which is for an indeterminate period, at the end of two years the city may become owner of the equipment by paying the investment cost. At the end of 20 years the entire system automatically becomes the property of the city. The units will be erected on ornamental concrete posts. Lake Park will be equipped with 192 lamps and South Shore Park with 38. The installation cost will total $25,300.

MOSINEE, WIS.—The Wisconsin Valley Electric Company, of Wausau, has purchased the holdings of the Mosinee Electric Light & Power Company.

NEW LONDON, WIS.—F. H. Joslyn, who represents an Oshkosh holding company that owns the Ostrander and other Little Wolf River power sites, has petitioned the City Council for a franchise to furnish electrical energy for light and power here. The proposition is a tentative one and is dependent on securing of contracts in Shiocton, Blackcreek and Seymour.

BRONSON, MINN.—Plans are being considered here for the installation of a street-lighting system. Energy will probably be secured from the plant at Hallock, Minn.

HIBBURG, MINN.—Charles L. Pillsbury, consulting engineer, Metropolitan Building, Minneapolis, is preparing plans for the construction of a building for the local municipal power plant, in which new equipment will be installed.

HOLT, MINN.—A contract for the installation of an electric light and power plant here has been awarded to H. J. Olson, of Warren, Minn.

LANCASTER, MINN.—Plans are being made for the installation of a municipal electric-lighting plant this fall or early next year.

PIPESTONE, MINN.—The Northwest Light & Power Company, of this city, will erect a transmission line to supply electrical energy for light and power in the towns of Edgerton, Woodstock, Jasper and Trosky.

ST. VINCENT, MINN.—The Pembina Light & Power Company, of Pembina, N. D., has been granted a franchise to build and operate a street-lighting system here. A transmission line will be erected from Pembina to this city.

SPRINGFIELD, MINN.—The installation of eight blocks of white-way system is being considered by property owners here.

WABASSO, MINN.—The Peoples Electric Light & Power Company, of Lamberton, will construct a transmission line from Lamberton to this city and furnish electric service here.

WANDA, MINN.—R. Wherland has been granted a franchise to erect and operate an electric light, power and heating plant here.

WOODSTOCK, MINN.—An election will probably be held soon to vote on the issuance of bonds to pay for the installation of a street-lighting system.

CEDAR RAPIDS, IOWA.—The Iowa Railway & Light Company will erect a high-tension transmission line from Iowa City to Iowa Junction.

DES MOINES, IOWA.—The Des Moines City Railway is asking for bids for the reconstruction of its generating station. One 1,000-kilowatt and one 5,000-kilowatt unit will be installed.

DES MOINES, IOWA.—Plans for the uniform lighting of the business district have been approved by the Greater Des Moines Committee. It is estimated that about 1,000 electroliers will be needed to build the system as outlined by the committee.

LITTLEPORT, IOWA.—Schmidt Brothers & Company, of Elkader, Iowa, have been granted a franchise to supply electric service here. A transmission line will be erected between the two towns, a distance of about eight miles.

KNOBNOSTER, MO.—The Knobnoster Electric Company has been incorporated with a capital of $20,000 by R. W. Morrison, W. S. McCall and Harry C. Loehr to operate an electric-lighting plant and to do a general electric business here.

ROCKPORT, MO.—Voters here are considering a proposition for the inauguration of 24-hour electric light and power service. Improvements to the municipal plant will be made if the proposition is approved.

BRIDGEPORT, KANS.—The offer made by the Gypsum (Kans.) Light & Power Company to install an electric-lighting system for this city has been accepted.

HERINGTON, KANS.—The Chicago, Rock Island & Pacific Railway Company has commenced the construction of a power plant here to serve the local shops. The estimated cost is $50,000.

BEATRICE, NEB.—An election will be held here to vote on the issuance of $25,000 in bonds, the proceeds to be used to build and equip a municipal electric-lighting plant.

HELVEY, NEB.—The City Council is investigating the matter of securing an electric street-lighting system.

GARRETSON, S. D.—Bonds in the sum of $18,000 have been voted, the proceeds to be used for rebuilding the local electric-lighting plant.

LANKIN, N. D.—M. S. Hyland, of Fargo, has been granted a franchise to construct and operate an electric-lighting plant here.

## SOUTH CENTRAL STATES.

FLEMINGSBURG, KY.—The Flemingsburg Light & Ice Company has purchased equipment for converting its plant from direct to alternating current.

FRANKLIN, KY.—S. Walton Forgy of Elkton, representing a number of capitalists, has asked for an electric-lighting franchise. A deal was consummated whereby the Franklin Electric & Ice Company will pass into the control of Mr. Forgy's clients for $62,000. It is understood that $13,000 will be expended on the plant. The present franchise will expire shortly and the new company is desirous of securing an extension.

HAZARD, KY.—The Kentucky River Power Company has let to C. E. Carlin, of Welch, W. Va. the contract for the erection of a power house near Hazard. One 2,000 and one 1,800-kilowatt turbine will be installed. The company has contracts with a number of coal mines to furnish electricity for a period of ten years. It is now furnishing service to several from a temporary plant, which also supplies service to this city.

IRVINE, KY.—The contract for construction of an addition to the local electric-lighting plant and to supply additional machinery has been let to N. B. Turbin.

## DATES AHEAD.

Illuminating Engineering Society. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., September 18-20. Assistant secretary, C. D. Fawcett, 29 West Thirty-ninth Street, New York City.

Association of Iron and Steel Electrical Engineers. Annual convention, Chicago, Ill., September 18-22. Secretary, W. O. Oschmann, Oliver Steel & Foundry Company, Pittsburgh, Pa.

Colorado Electric Light, Power and Railway Association. Annual meeting, Glenwood Springs, September 21-23. Secretary, T. F. Kennedy, 900 Fifteenth Street, Denver, Colo.

American Electrochemical Society. Semi-annual meeting, New York City, September 28-30. Secretary, J. W. Richards, South Bethlehem, Pa.

American Electric Railway Association. Annual convention, Atlantic City, N. J., October 9-13. Secretary, E. B. Burritt, 8 West Fortieth Street, New York City.

Electrical Supply Jobbers' Association. Quarterly meeting, Hotel Statler, Cleveland, O., October 10-12. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

New England Section, N. E. L. A. Annual convention, Pittsfield, Mass., October 17-20. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Jovian Order. Annual convention, Indianapolis, Ind., October 18-20. Secretary, Ell C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Telephone Pioneers of America. Annual meeting, Atlanta, Ga., October 19-20. Secretary, R. H. Starrett, 195 Broadway, New York City.

LEXINGTON, KY.—A contract has been awarded by the Kentucky Traction & Terminal Company to the Edge Moor Iron Company, of Edge Moor, Del., for the installation of a 500-horsepower boiler in the company's power plant here. The Armstrong Engineering Company, of Taylorville, Ill., is erecting an addition to the plant to care for the new equipment.

MAYFIELD, KY.—The city, which has issued bonds for the purchase of the Mayfield Water & Light Company, has sued to enforce the terms of the provision in the expired franchise, which provided that the city might purchase the plant at the end of the franchise term.

STONY FORK, KY.—Minton & Company and others have asked the Middleboro City Council for an extension of its electric-lighting service to this place.

UNIONTOWN, KY.—A. L. Carpenter and Ross Lucas, owners of the Home Lighting Company, announce the sale of the property to a corporation, which they do not name, operating a number of plants in Western Kentucky. They state that the new company will give 24-hour service.

BIRMINGHAM, ALA.—The McClary-Jemison Machinery Company is planning to purchase three 150-kilowatt, 550-volt, direct-current, engine-type generators, complete with switchboard. Turbine-driven units will also be considered.

OKLAHOMA CITY, OKLA.—The Blue River Power Company has been incorporated with a capital of $150,000 by W. M. Lucas, W. H. Bingham and D. C. Teter.

TULSA, OKLA.—The power plant of the Hickory coal mines, four miles east of this city, was destroyed by fire recently, causing a loss of about $10,000.

SHERMAN, TEX.—The Grayson Telephone Company has been awarded the contract by the City Council for installation of an electric fire-alarm system here, to cost $10,000.

TERRELL, TEX.—If the proposition is confirmed by vote the municipal electric-lighting plant here will be sold to the Texas Power & Light Company, of Dallas, for a consideration of $55,000. The latter concern has extended its transmission lines to Terrell.

## WESTERN STATES.

CUT BANK, MONT.—An election will be held here soon to decide on granting a franchise for the installation and operation of an electric-lighting system.

FLORENCE, ARIZ.—The Florence Improvement Company, a subsidiary of the Douglas Investment Company, has applied for an electric-lighting franchise in this city.

TEMPE, ARIZ.—The City Council has been petitioned to call an election to vote bonds for a municipal lighting system. It is proposed to either purchase the holdings of the South Side Gas & Electric Company or to install a new system.

CRAIG, COLO.—William Laidlow, manager of the electric plant at Meeker, Colo., has asked the City Council for a franchise to operate a plant in this city.

ESTES PARK, COLO.—Plans are being made here for the purchase and enlargement of the local electric-lighting plant, now owned by the Stanley Hotel, by the city.

LEHI, UTAH.—With a minimum capacity of 2,000 horsepower and a maximum of double this amount a power plant will be built at the mouth of Deer Creek in American Fork Canyon at a cost of $175,000. The plant will supply power for the pumps that elevate water at the head of Jordan River from Utah Lake for the Associated Canal Companies of Salt Lake, County. Money to hold the option has been paid. Data are now being secured by Sylvester Q. Cannon, engineer for Salt Lake, and W. A. Knight, manager of the Canal companies. The plant will be ready to supply power for the pumps in 1918. While the pumps now consume 900 horsepower of electric current, in two years more 300 additional will be added. The balance, according to the promoters, will be used to supply Lehi with energy for power and light, but in order to do this a special act of the Legislature will be necessary to permit Lehi to issue bonds to construct a distribution system.

BURLEY, IDAHO.—It is reported that $20,000 will be expended for improvements and extensions to the municipal electric-lighting system.

COEUR D'ALENE, IDAHO.—William Dollar has been granted a franchise to install in the streetse of this city a system for distributing electricity for lighting, heating, power and other purposes.

KENDRICK, IDAHO.—Articles of incorporation of the Potlatch Consolidated Electric Company have been filed with a capital stock of $50,000 by A. V. Dunkle, A. Wilmot and A. W. Dunkle. This is the company now furnishing light and power in Kendrick under the managemet of A. V. Dunkle.

BREMERTON, WASH.—Bids will be received at the navy yard up to September 30 for a heating and power plant to be installed at Keyport.

MORTON, WASH.—Repairs are being made to the local electric lighting plant by its owner, C. O. Smith. The dam is being raised to enable the plant to operate at extreme low water. The improvements will cost about $1,000.

KLAMATH FALLS, ORE.—The Keno (Ore.) Power Company has applied for a franchise in this city.

BAKERSFIELD, CAL.—The Southern Sierras Power Company has applied to the supervisors of Kern County for a 50-year blanket franchise. Bids will be received for the proposed franchise up to October 7.

LOS ANGELES, CAL.—The City Council has ordered the preparation of an ordinance for oramental lights on Fifty-fifth Street between Budlong and Normandie Avenues.

OROVILLE, CAL.—It is understood that if the Railroad Commission approves the transfer of the public utility properties of the Oro Electric Corporation to the Pacific Gas & Electric Company, the latter company will perfect plans for the immediate construction of the proposed power plant in Humbug Valley.

PETALUMA, CAL.—At a recent meeting of taxpayers of the Cinnabar lighting district it was decided to install additional lighting units.

REDLANDS, CAL.—The Southern California Edison Company has leased quarters in the Fisher Block, where it will establish offices.

RIVERSIDE, CAL.—Amended articles of incorporation have been filed here by the Banning Gas & Lighting Company, of Banning, Cal. The company will have a capital stock of $25,000, the incorporators being C. D. Hamilton, C. S. Holcomb and others.

SAN LEANDRO, CAL.—The City Trustees have ordered that the telephone wires must be placed underground in the business section of the city.

SANTA BARBARA, CAL.—The City Council will hear protests on September 21 regarding the installation of ornamental concrete lighting standards on State Street between Ocean Boulevard and Victoria Street.

UPLAND, CAL.—The hydroelectric plant of the Pacific Electric Railway was de-

stroyed by fire recently, the loss being about $20,000.

VISALIA, CAL.—The formal transfer of the Mt. Whitney Power & Electric Company to its new owners, the Pacific Light & Power Company, took place at a special meeting of the stockholders held for the purpose of making certain changes in the by-laws, electing directors, etc.

### CANADA.

RICHIBUCTO, N. B.—The municipalities of Richibucto and Rexton are at the present time engaged jointly in the construction of a dam on the Kouchibouguac River for the purpose of supplying the two towns with electric light and power. The plant will be designed to develop about 250 horsepower, and the entire scheme calls for the expenditure of $25,000 to $30,000. Work on the dam is well under way, the station has been begun, and it is possible that the commissioners may be in position to furnish light by the end of 1916.

ST. JOHN, N. B.—City officials are preparing plans for the installation of a new electric-lighting system. It is proposed to replace the present arc lamps with about 600 nitrogen-filled lamps of 300 and 600 candlepower.

NOKOMIS, SASK.—Plans are being made here for the installation of an electric-lighting plant.

## Proposals

ELECTRIC TRAVELING CRANE.—Sealed proposals will be received by the Chairman of the Board of Awards, Department of Agriculture, Washington, D. C., until September 29, for furnishing and erecting one 10-ton electric traveling crane at Arlington Farm, near Rosslyn, Va.

ELECTRIC DISTRIBUTION SYSTEM.—Sealed bids will be received until September 20 for labor and materials required in the construction of an electric transmission line and distribution system in Hoffman, Minn. Plans are on file in the office of Earle D. Jackson, consulting engineer, St. Paul, Minn.

ELECTRICAL WORK.—Bids will be received until September 28 by the State Board of Control, Madison, Wis., for heating apparatus, electrical work, engines and fixtures for buildings at the Southern Home for Feeble-minded at Union Grove. Separate bids will be received on heating and ventilating, interior electric wiring, and pole line, transformers, switchboard, generators, and exciters, engines, and lighting fixtures. Vaughn & Meyer, Majestic Building, Milwaukee, are the engineers.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 116, Boston, Mass., furnishing and installing motor and control equipment. Schedule 122, Brooklyn, N. Y., miscellaneous single-conductor wire. Schedule 126, Brooklyn, N. Y., six electric water-heaters. Schedule 127, Brooklyn, N. Y., 52 three-horsepower, 230-volt motors. Schedule 134, Brooklyn, N. Y., eight 10-kilowatt radio transmitting sets. Bidders desiring to submit proposals should make application immediately for schedules to the Bureau, or to the purchasing office nearest to navy yard where delivery is to be made.

## Foreign Trade Opportunities

*[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]*

NO. 22,095. FIBER, COPPER THREAD, ETC.—A firm of manufacturers of electric medical apparatus advises an American consular officer that it wishes to import electric measuring apparatus, sheets and bars of fiber, copper thread covered with silk, X-ray accessories, etc. Correspondence in Spanish.

NO. 22,119. ELECTRIC MOTORS, ETC.—A firm in the United States writes the Bureau that one of its clients in South America, with offices in Argentina, Brazil, Uruguay, Paraguay, and Chile, purchasing goods for its own account, desires to enter into commercial relations with American manufacturers and exporters of electric motors, appliances and supplies.

NO. 22,126. ELECTRICAL EQUIPMENT.—An American consular officer in South America writes that a firm in his district contemplates the installation of an electric-lighting plant and desires quotations on the following equipment: One Diesel engine coupled direct to a 35-kilowatt, 220-volt, two-wire generator, and one spare generator; 2,500 lamps, from 16 to 50 candlepower; insulators, wire, and meters.

NO. 22,192. ELECTRICAL SUPPLIES.—An American consular officer in Australia reports that a business man in his district desires to represent American manufacturers of electrical appliances and machinery, such as electric irons, fans, etc.

NO. 22,208. INCANDESCENT LAMPS.—The representative of an electric light and power company in South America, who is now in the United States, desires to communicate with manufacturers and exporters of incandescent electric lamps.

NO. 22,251. ELECTRIC LIGHTING.—The American consul in Trinidad, British West Indies, reports that the Government of Grenada, British West Indies, will receive proposals until October 31, 1916, for supplying electricity for lighting and power purposes in the town of St. Georges, Grenada, and residential suburbs within a radius of three miles. A copy of the plan of the town and a memorandum of particulars will be supplied on application, which should be accompanied by a deposit of £2 2s., which will be refunded if the plan and memorandum are returned with a bona fide tender. Tenders should be addressed to the Colonial Secretary, Grenada, British West Indies. The Bureau has no further information in regard to this opportunity.

NO. 22,336. ELECTRICAL MACHINERY AND SUPPLIES.—The Bureau is in receipt of a letter from a firm in Mexico stating that it is engaged in the importation of electrical machinery and appliances, maintaining show rooms and a retail store. It is stated that the manager of the machinery department is a graduate of an American technical college. The firm is especially interested in switchboards, insulators, transformers, heating devices, lamps, fixtures of all kinds, glassware, etc. References. Photographs illustrating the firm's display windows may be examined at the Bureau or its district offices. Refer to Miscellaneous No. 146.

TELEPHONE AND TELEGRAPH SUPPLIES.—The President of Guatemala has authorized the expenditure of the sum of $25,571.41 American gold for supplies which the National Telegraph and Telephone department will order. The National Treasury is authorized also to pay insurance and freight on this shipment to Puerto Barrios.

## New Incorporations

AKRON, O.—Loomis Electric Company. Capital, $10,000. Incorporators: C. H. Loomis, C. E. Loomis and others.

NEW YORK, N. Y.—Arrow Electrical Contracting Company. Capital $500. Incorporators: M. Schwartz, A. Bikales and M. Cardos.

PORTLAND, ME.—James H. Carey Electrical Works. Capital, $10,000. To do a general electrical business. Incorporators: H. F. Merrill, D. C. Kimball and G. T. Davis.

DOVER, DEL.—United Battery Company. Capital, $3,000,000. Manufacture and deal in electric storage batteries. Incorporators: G. C. Prerich and F. O. Balch, of Chicago, Ill., and Marion Luce, of Oak Park, Ill.

ST. LOUIS, MO.—Fore Electrical Manufacturing Company. Capital, $10,000. Manufacture electrical tools, devices and appliances of all kinds. Incorporators: Albert Wehmeier, J. H. McEwen and L. R. Brown.

## Financial Notes

The statement of the Pacific Gas & Electric Co. for the month of July showed an increase in net income of $10,676 over the corresponding month of last year, and a gain in surplus of $2,546 for the month.

The Northwestern Electric Company, made up of San Francisco capital, has completed the distribution of an additional $500,000 preferred six-per-cent stock. All the $2,000,000 preferred stock was not placed on the market when the company was organized. About $1,800,000 of the stock is now outstanding.

Massachusetts Electric Companies for August made a gain in gross of $120,218, or 13.33 per cent above August, 1915. This gain was $50,000 larger than the gain made in any month of the fiscal year which ended June 30. For first two months of current fiscal year gross revenues have increased $182,000 over the first two months of the last previous fiscal year.

Western Canada Power Company's plan of financial reorganization is now an assured success, as substantially none of the six-per-cent three-year notes were withdrawn from deposit with the reorganization committee. As a result the plan became effective September 1. Under the plan the security of the holders of the bonds is unchanged, while the holders of the notes paid $800,000 new capital into the company.

The Wisconsin Railroad Commission has authorized the Wisconsin-Minnesota Light & Power Company, a subsidiary of American Public Utilities Company, to issue $312,500 preferred stock and $750,000 in five-per-cent bonds. Proceeds of the new issues are to meet expenditures for hydro-electric plant under construction on Chippewa River and for completing transmission system. The issue of these securities will make outstanding bonds $2,250,000 and outstanding preferred stock $937,500. Energy from the new plant will be supplied to Chippewa Valley towns, but the larger part will be sold to Northern States Power Company, under long contract, for distribution in Minneapolis and St. Paul.

The California Railroad Commission has handed down a decision fixing the valuation of the Southern California Edison Company's electric service property, sought by the city of Los Angeles, at $4,750,000 for the property and business actually taken, and an additional sum of $1,578,000 as "severance" damages to property located outside the city, and not to be taken over by the city, but which the commission found would be diminished in value by severance. The Edison company asked $20,000,000 for the property sought and severance damages.

### Dividends.

| | Term | Rate | Payable |
|---|---|---|---|
| Allis-Chalmers Mfg. | Q | 1.5 % | Oct. 16 |
| Brazil Tr., Lt. & Pw., pf. | Q | 1.5 % | Oct. 2 |
| Buffalo Gen. Elec., com. | Q | 1.5 % | Sept. 30 |
| Cent. States Elec. Corp., pf | Q | 1.75% | Sept. 30 |
| Consumers El. Lt. & Pw., of New Orleans, pf. | Q | 1.75% | Sept. 30 |
| Dayton Pw. & Lt., pf. | Q | 1.5 % | Oct. 1 |
| Duluth Edison Elec., pf. | Q | 1.5 % | Oct. 1 |
| Elec. Stor. Batt., pf. | Q | 1 % | Oct. 2 |
| Elec. Stor. Batt., com. | Q | 1 % | Oct. 2 |
| Galv.-Hous. Elec., pf. | S | $3.00 | Sept. 15 |
| Interb. Rap. Tran. | Q | 5 % | Oct. 2 |
| Kansas City Rys. | — | 2.5 % | Oct. 1 |
| Manila Elec. R. R. & Ltg. Corp | Q | 1.5 % | Oct. 1 |
| Manhattan Ry. | Q | 1.75% | Oct. 1 |
| Montreal Tram., deb. | S | 2.5 % | Oct. 2 |
| No. American | Q | 1.25% | Oct. 2 |
| N. Y. State Rys., com. | Q | 1.25% | Oct. 2 |
| N. Y. State Rys., pf. | Q | 1.25% | Oct. 2 |
| Phila. Trac. | S | $2.00 | Oct. 2 |

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

| | Sept. 11 | Sept. 4 |
|---|---|---|
| American Telephone & Telegraph (New York) | 133 | 130¾ |
| Commonwealth Edison (Chicago) | 142¼ | 141 |
| Edison Electric Illuminating (Boston) | 237 | 237 |
| Electric Storage Battery common (Philadelphia) | 65½ | 67¾ |
| Electric Storage Battery preferred (Philadelphia) | 65½ | 67¾ |
| General Electric (New York) | 171 | 167 |
| Kings County Electric (New York) | 130 | 130 |
| Massachusetts Electric common (Boston) | 7 | 7 |
| Massachusetts Electric preferred (Boston) | 40 | 40½ |
| National Carbon common (Chicago) | 185 | 185 |
| National Carbon preferred (Chicago) | — | 121 |
| New England Telephone (Boston) | 127⅝ | 127 |
| Philadelphia Electric (Philadelphia) | 28⅞ | 28¾ |
| Postal Telegraph-Cable common (New York) | 84 | 83 |
| Postal Telegraph-Cable preferred (New York) | 66½ | 67 |
| Western Union (New York) | 95½ | 94½ |
| Westinghouse common (New York) | 61 | 58⅝ |
| Westinghouse preferred (New York) | 70 | 70 |

| | | |
|---|---|---|
| Shawinigan Wt. Pw., pf.-Q | 1.75% | Oct. 10 |
| Springfield Ry. & Lt., pf.-Q | 1.75% | Oct. 2 |
| West Indies Elec.-Q | 1.25% | Oct. 2 |

### Reports of Earnings.

ONTARIO POWER OF NIAGARA FALLS.

Ontario Power Company of Niagara Falls and Ontario Transmission Company, Ltd., reported combined earnings for the six months ended June 30, as follows:

| | 1916 | 1915 |
|---|---|---|
| Gross earnings | $1,144,798 | $926,468 |
| Net earnings after purchased power, rentals and expenses | 689,180 | 593,284 |
| Total income | 755,932 | 680,951 |
| Refunding expenses | 38,009 | 38,322 |
| Interest charges | 468,645 | 505,443 |
| Surplus | 249,278 | 137,186 |

Earnings of Ontario Transmission Company alone for the six months were $151,809 gross, compared with $122,614 for the first six months of 1915, while net was $42,517 compared with $10,304.

EASTERN TEXAS ELECTRIC.

| | 1916 | 1915 |
|---|---|---|
| July gross | $ 72,309 | $ 65,068 |
| Net after taxes | 33,317 | 31,053 |
| Twelve months' gross | 797,880 | 676,520 |
| Net after taxes | 379,176 | 293,047 |

PUGET SOUND TRACTION, LIGHT & POWER.

| | 1916 | 1915 |
|---|---|---|
| June gross | $ 632,891 | $ 592,737 |
| Net after taxes | 224,448 | 210,380 |
| Surplus after charges | 39,797 | 29,037 |
| Twelve months' gross | 7,710,459 | 7,908,397 |
| Net after taxes | 2,772,525 | 3,082,579 |
| Surplus after charges | 573,151 | 930,807 |

BYLLESBY PROPERTIES.

Combined earnings of all properties under management of H. M. Byllesby & Company for July, 1916, and the 12 months ended July 31 show:

| | 1916 | 1915 |
|---|---|---|
| July gross | $1,243,469 | $1,126,171 |
| Net after taxes | 578,564 | 413,421 |
| Twelve months' gross | 16,412,807 | 15,078,929 |
| Net after taxes | 8,095,572 | 7,268,104 |

AMERICAN PUBLIC UTILITIES.

American Public Utilities Company and subsidiaries reported combined income account for year ended June 30, 1916, as follows:

| | 1916 | 1915 |
|---|---|---|
| Gross | $3,309,586 | $2,932,070 |
| Expenses and taxes | 1,842,801 | 1,614,239 |
| Net | 1,466,785 | 1,313,831 |
| Other income | 81,744 | 25,930 |
| Total income | 1,548,529 | 1,339,761 |
| Expenses | 39,437 | 38,101 |
| Underlying charges | 993,859 | 862,300 |
| Collecting bond interest | 64,867 | 36,667 |
| Note interest | 48,549 | 11,183 |
| Other interest | 6,743 | 43,958 |
| Surplus | 395,073 | 349,551 |
| Preferred dividends | 234,840 | 234,840 |
| Balance | 160,233 | 114,711 |

TENNESSEE RAILWAY, LIGHT & POWER.

Tennessee Railway, Light & Power reported combined earnings of subsidiaries for the seven months ended July 31, 1916 as follows:

| | 1916 | 1915 |
|---|---|---|
| Gross revenues | $2,710,604 | $2,186,444 |
| Net after tax and rent | 1,270,121 | 891,983 |
| Surplus after charges and dividends on stocks not owned | 428,803 | 65,683 |

Tennessee Power Company, the principal generating and transmission subsidiary, reported July gross of $53,145, an increase of 82 per cent over July 1915, with net of $78,952, a gain of 100 per cent, and surplus after charges of $37,252, compared with a deficit of $2,422 in July, 1915.

NEW ORLEANS RAILWAY & LIGHT.

New Orleans Railway & Light Company, a subsidiary of American Cities Company, controlled by United Gas & Electric Corporation, reported earnings for the six months ended June 30 as follows:

| | 1916 | 1915 |
|---|---|---|
| Gross | $3,594,643 | $3,520,748 |
| Net | 1,367,797 | 1,368,637 |
| Surplus after charges | 467,273 | 498,439 |
| Balance after renewal and replacement reserves | 339,906 | 423,273 |

## New Publications

VIBRATION.—The Aberthaw Construction Company, Boston, Mass., has published a pamphlet giving a preliminary report on an investigation into "The Effects of Vibration in Structures." Opinions from many sources are quoted.

WATER POWERS OF CANADA.—The Water Power Branch of the Department of the Interior, Dominion of Canada, has published under the title "Water Powers of Canada," collected reprints of five monographs prepared for distribution at the Panama-Pacific International Exposition. The five papers deal separately with British Columbia, Prairie Provinces, Ontario, Quebec, and the Maritime Provinces. They are profusely illustrated with maps, half-tones, etc., and make a volume of 362 pages. They were written by well known engineers.

# Electrical Patents Issued September 5, 1916

### Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

**1,196,760. Headlight Dimmer.** H. S. Clark, Chicago, Ill. Collapsible, translucent shield for lamp front.

**1,196,761. Telephone System.** H. P. Clausen, assignor to Western Electric Co., New York, N. Y. Calling subscriber given sound of bell ringing when ringing current applied to called line.

**1,196,767. Method of Changing the Composition of Iron and Steel.** B. Ford, Philadelphia, Pa. Employs resistance electric heating.

**1,196,773. Direct-Current Mechanism.** C. W. Girvin, assignor to Girvin Electrical Development Co., Honolulu, Hawaii. Details of constant-potential dynamo having open-circuited armature coils.

**1,196,774. Control of Direct-Current Machines.** C. W. Girvin, assignor to Girvin Electrical Development Co. Generating coils are cut in and out at will.

**1,196,778. Motor Controller.** C. T. Henderson, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Automatic and manual control of field resistance.

**1,196,781. Attachment for Trolley-Wire Hangers.** J. Hoylman, assignor of one-half to H. R. Jones, Coalton, W. Va. To provide safety guards.

**1,196,788. Panelboard.** W. Klement, assignor to Siemens-Schuckert Werke, G. M. B. H., Berlin, Germany. Special structure having number of units in desired groups of rows.

**1,196,791. Globe-Holder.** H. W. Kruger, Aberdeen, S. D. Has special grip for neck of spherical-lamp inclosure.

**1,196,792. Connector for Electrical Conductors.** T. F. Leahey, Poughkeepsie, N. Y. Insulating sleeve receives conductor ends and twists them on rotation of its parts.

**1,196,793. Automatic Telephone-Exchange System.** A. E. Lundell, assignor to Western Electric Co. Details of machine switching system.

**1,196,795. Means for Lighting Auditoriums and Other Places.** F. G. McPherson, assignor to Shado-Lite Mfg. Co., Beaver Falls, Pa. Details of suspended lamp box.

**1,196,798. Cable Hanger.** R. Magle, Logan, O. Special structure of metal strip for inclosing cable.

**1,196,805. Prospective Circuit.** J. C. R. Palmer, assignor to Western Electric Co. Shunt about protected device electrothermally controlled by current through device.

**1,196,817. Storage Battery.** E. W. Smith, Philadelphia, Pa. Plate separator.

**1,196,819. Method of Removing Drilling Tools.** W. O. Snelling, Pittsburgh, Pa. In removing well-drilling tools, tool is made the anode and the tool electrically oxidized.

**1,196,826. Circuit-Controlling Switch.** W. S. Unglesby, Volusia, Fla. For mounting on steering post of automobile to control direction indicator.

**1,196,837. Photographic Recorder.** A. E. Blonder, Paris, France. Electric control and light for device recording movements of instrument.

**1,196,847. Pay-Station Telephone System.** C. J. Erickson, assignor to Automatic Electric Co., Chicago, Ill. Automatic system.

**1,196,852. Rocking Electrode.** E. Fulda, New York, N. Y. For electric welding machine.

**1,196,853. Crossing Gate.** J. J. Gard, asignor to Buda Co., Chicago, Ill. Gearing for motor-driven apparatus.

**1,196,855. Signal Transmitter Testing Device.** C. L. Goodrum, assignor to Western Electric Co. Tape receives imprints from standard and tested apparatus.

**1,196,857. Magnetic Coin-Testing Device for Coin-Controlled Machines.** A. D. Grover and A. Coseglia, assignor to Autosale Gum & Chocolate Co., New York, N. Y. Special arrangement of magnet for removing magnetic disks.

**1,196,867. Pole Piece of Magnetos and Other Electric Generators.** A. K. Dorian, Lyon, France. Special form where armature has axis in plane of horseshoe.

**1,196,876. Automatic Telephone and Supervisory System.** F. Lubberger, assignor to Automatic Electric Co., Chicago, Ill. Interrelation of main and sub exchanges.

**1,196,904. Electric Welder.** C. H. Thornblade, assignor to Pacific Electric Welder & Mfg. Co., Seattle, Wash. Cooling arrangement in spot welder.

**1,196,913. Electric Candlelamp.** L. Weidlich, Stratford, Conn. Portable battery lamp simulates candlestick.

**1,196,927. Transmission Mechanism for Starting and Lighting Apparatus.** A. P. Brush, Detroit, Mich. Starting and lighting machine, is belt driven and has belt tension varied according to character of operation.

**1,196,938. Method and Apparatus for Amplifying Electric Impulses.** R. A. Fessenden and L. Cohen, assignors to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. For amplifying received signals in wireless telegraphy.

**1,196,941. Safety Appliance for Railways.** J. E. Fishes, New York, N. Y. For preventing collisions between leading and following cars.

**1,196,948. Electric-Circuit-Sealing Plug.** A. S. Harrington, Stockton, Cal. For insertion in fuse receptacles. (See cut, next page.)

**1,196,949. Wireless Signaling System.** W. Harrison, New York, N. Y. Telephonic.

**1,196,950. Lighting Apparatus.** E. A. Hawthorne, Bridgeport, Conn. For vehicles; structure having battery and low-power lamp also has high-power lamp fed from outside source.

**1,196,951. Lamp-Cowl.** E. A. Hawthorne, Bridgeport, Conn. For headlight.

**1,196,969. Method of and Apparatus for Producing Electric Oscillations from Alternating Currents.** J. Murgas, Wilkes-Barre, Pa. For production of high-frequency oscillations for wireless telegraphy and telephony.

**1,196,990. Laundry Iron.** M. H. Shoenberg, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. For use as iron or stove.

**1,196,999. Dry Cell.** F. L. White, assignor to National Carbon Co., Cleveland, O. Manner of waterproofing pasteboard jacket.

**1,197,001. Turret Telltale Indicator.** F. W. Wood, assignor to Charles Cory & Son, New York, N. Y. For indicating firing pistons of gun turrets.

**1,197,004. Automatic Delivery-Signal for Mail-Boxes.** F. W. Ayer and M. L. Anderson, Sacramento, Cal. Circuit is closed when lid is opened.

**1,197,022. Storage-Battery Cell.** E. G. Callagher, assignor to Lake Torpedo Boat Co., Bridgeport, Conn. Tank structure.

**1,197,042. Melting-Pot Heater for Type and Similar Machines.** W. D. Ludwick, Tacoma, Wash. Heating current induced in material by alternating current.

**1,197,045. Electric Signaling System.** J. McFell, Chicago, Ill. Annunciator.

**1,197,048. Machine Telephone Switching System.** W. H. Matthies, assignor to Western Electric Co., New York, N. Y. Arrangement of relays and controlling circuits for automatic multiposition switches.

**1,197,089. Automobile Signal.** F. W. Woldridge and J. K. French, Brooklyn, N. Y. Details of device comprising electromagnetically operated signal arm.

**1,197,092. Dynamoelectric Machine.** T. S. Allen, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Manner of securing coils of rotating fields.

**1,197,094. Combined Floor and Electric Conduit System for Steel Cars.** C. H. Anderson, Cincinnati, O. Details of metal structure.

**1,197,099. Temperature Compensator for Vibrating Regulators.** W. L. Bliss, assignor to U. S. Light & Heat Corp., Niagara Falls, N. Y. Vibrating member is

compensated for temperature rise of operating coil.

**1,197,108. Auxiliary Trolley Device.** W. J. Davis, assignor of one-half to E. P. Schell, Windfall, Ind. Sleet cutter.

**1,197,124. Brake for Talking Machines.** W. H. Hoscke, assignor to Crescent Talking Mahine Co., New York, N. Y. Magnetically operated.

**1,197,130. Annunciator.** F. Konicek, Chicago, Ill. Details of magnetically operated signal.

**1,197,131. Battery Lamp.** N. Kribs, Dundee, Ill. Structural details.

**1,197,137. Method of Reducing Metals.** R. J. McNitt, assignor to Roessler & Hasslacher Chemical Co., New York, N. Y. Manner of reducing compounds to their metals by electrolysis.

**1,197,138. Insulated Tool.** W. V. B. Marquette, Yonkers, N. Y. Manner of securing tool to insulated handle.

**1,197,147. Dynamoelectric Machine.** C. Algernon Parsons and A. H. Law, New Castle upon Tyne, England. Arrangement of conductors in slots of high-speed machines as turbogenerators.

**1,197,159 and 1,197,160. Electrical System of Regulation.** W. A. Turbayne, assignor to U. S. Light & Heat Corp. Car-lighting systems with vibratory-contact regulators.

**1,197,161. Electric Regulator.** W. A. Turbayne, assignor to U. S. Light & Heat Corp. Vibratory-contact relay.

**1,197,162. Tapering Charge Regulator.** W. A. Turbayne, assignor to U. S. Light & Heat Corp. Car-lighting system with vibratory-contact regulator.

**1,197,163. Telephone System.** R. I. Utter, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Structure and connections of universal cord circuit.

**1,197,166. Universal Cord Circuit for Telephone Systems.** C. S. Winston, assignor to Kellogg Switchboard & Supply Co. Modification of above.

**1,197,168. Contact-Pin for Circuit-Closing Members.** A. A. Ziegler, assignor to United States Apparatus Co. Boston, Mass. Contact-pin frictionally held in socket in support, repeated blows tending to upset pin and increase the holding friction.

**1,197,171. Condensation Product of Phenols and Formaldehyde and Process of Making Same.** J. W. Aylsworth, assignor to Condensite Co. of America, Bloomfield, N. J. Insulating material.

**1,197,175. System of Electrical Regulation.** W. L. Bliss, assignor to U. S. Light & Heat Corp. Vibratory-contact regulation of car-lighting system.

**1,197,176. and 1,197,177. Automatic Electric Regulator.** W. L. Bliss, assignor to U. S. Light & Heat Corp. Vibratory-contact devices for car-lighting systems.

**1,197,178. Electric Regulator.** W. L. Bliss, assignor to U. S. Light & Heat Corp. Vibratory-contact device for car-lighting systems.

**1,197,179. Adapters for Car-Lighting Generators.** W. L. Bliss, assignor to U. S. Light & Heat Corp. Relates to generator suspension.

**1,197,180. Safety Device for Elevators.** T. T. Boyle, assignor of one-half to F. D. Andrus. Detroit, Mich. Door switch.

**1,197,185. Telephone Exchange.** E. E. Clements, assignor to J. R. Garfield, Cleveland, O. Inter-relation of automatic switches in link connections.

**1,197,187. Light-Distributing Device.** D. Crownfield, Cambridge, Mass. Fixture has lamp in bowl deflecting light upward and bell contains lamp throwing light downward.

**1,197,207. Incandescent Lamp With Concentrated Metallic Filaments.** H. J. Jaeger, assignor to Jaeger Co., Hoboken, N. J. Mountings, etc., of filaments which may be energized alone or together.

**1,197,208 and 1,197,209. Automatic Electric Regulator.** J. W. Jepson, assignor to U. S. Light & Heat Corp. Vibratory-contact regulators for car-lighting systems.

**1,197,212. Signal System for Reciprocally Controlling Several Stations.** P. Kaminski, assignor to Siemens & Halske A. G., Berlin, Germany. For controlling rotary objects each located at a station.

**1,197,218. Warning Signal for Railway Crossings.** D. J. McCarthy, assignor to Union Switch & Signal Co., Swissvale, Pa. Has arrangement of lamp and mirror for producing reciprocating projected light beam.

**1,197,237. Automobile Lamp.** W. S. Sherlock, Toledo, O., assignor of one-fourth to A. W. Griffin, one-fourth to W. C. Schoeler and one-fourth to C. R. Fisher, Toledo, O. Headlight has electromagnetically adjusted reflector.

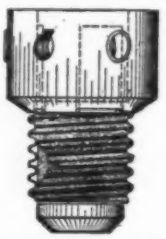
**1,197,246. Battery Connector.** F. Wright, assignor to Wright Storage Battery Co., Poughkeepsie, N. Y. For connecting storage-battery plates.

**1,197,262. Rotary Electrical Converter or Rectifier.** W. E. Butler, David City, Neb. Special connections of commutator-driven synchronous motor.

**1,197,273. Electrical Signaling System.** E. Ehrhardt, assignor to Siemens & Halske, Berlin, Germany. Details of system having contact systems at receiving and sending ends operated in synchronism.

**1,197,275. Electrical Furnace.** A. Elmer, New York, N. Y. Special mounting of resistor.

**1,197,312. Storage-Battery Separator.** W. Weida, assignor to India Rubber Co.,



No. 1,196,948.—Electric-Circuit-Sealing Plug.

Highland Park, N. J. Special structure of perforated non-conductive sheet having spacing ribs.

**1,197,316. Condensation Product of Phenols and Formaldehyde.** T. S. Wennadel, assignor to Firm Nammlooze Vennootschap Hollandsche Proteine, Maatschappoj, Amsterdam, Netherlands. Insulating material.

**1,197,321. Automatic Guard-Control for Dough-Mixers.** C. Willersdor, Paterson, N. J. Circuit of mixing motor controlled by cover.

**1,197,338. Massage-Vibrator.** W. Broad, Beaver Falls, Pa., assignor of three-fourths to H. E. McLain, Pittsburgh, Pa. Electromagnetically operated.

**1,197,339. Plug-Switch Box for Series Circuits.** R. W. Brodmann, New York, N. Y. Box has fixed lamp on it and plug contacts for drop light.

**1,197,366. Wireless Signalling Apparatus.** W. Hahenemann, Kiel, Germany. For attachment to hull of ship.

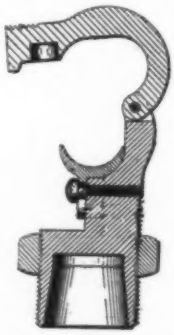
**1,197,372. Underground Conductor for Electric Railways.** A. Hertlain, New York, N. Y. Sectional conductor conduit system.

**1,197,379. Operating Electric Circuits.** M. H. Loughbridge, Woodcliff on Hudson, N. J. Railway block-signal system.

**1,197,383. Headlight for Automobiles.** S. J. Meneely, Newburgh, N. Y. Arrangement and structure of screen.

**1,197,435. Car-Wheel Grinder or Planer.** C. C. Bogue, Hugo, Colo. Motor-driven.

**1,197,458 and 1,197,459. Electric Furnace.** J. L. Dixon, Detroit, Mich. First patent.



No. 1,197,487.—Electrical Coupling.

Supplied through "Scott-connected" transformers from three-phase mains. Second patent: modification.

**1,197,460 and 1, 197,461. Telegraphy.** T. B. Dixon, New York, N. Y. Operated by action of radiant energy on radio-electrosensitive element.

**1,197,470. Electric-Sign Socket.** L. Feldman and M. Davis, Denver, Colo. Details of structure for ready securing in sign plate.

**1,197,473. Signaling Device.** P. W. Fuller, Boston, Mass. Distance determined by electrical waves.

**1,197,481. Switch.** G. F. Haines, Cape Cottage, Me. Details of rotary wall switch.

**1,197,485. Lightning Arrester.** W. J. Heinritz, Norristown, Pa. Horn-gap type.

**1,197,487. Electrical Coupling.** J. L. Hinds and J. J. Dossert, assignors to Crouse-Hinds Co., Syracuse, N. Y. Details of clamp. (See cut.)

**1,197,497. Switch.** E. R. Johnson and H. H. Murray, assignors to Victor Talking Machine Co. Adapted for control by sound arm of phonograph.

**1,197,507. Position-Indicator for Elevators.** H. G. Lee, assignor of one-half to E. H. Robbins, Tacoma, Wash. Structural details.

**1,197,509. Switching Device.** P. M. Lincoln, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Joint regulation of mechanically connected dynamo and double-current generator.

**1,197,511. Electric Hair-Brush.** E. Loewenharz, Chicago, Ill. Has bristles of high and low heat conductively, heat being supplied to latter.

**1,197,537. Commutator.** J. F. Parker, assignor to Universal Commutator Co., Mobile, Ala. Special structure for ignition systems.

**1,197,542. Electrical Step-by-Step Translating Device.** L. M. Potts, assignor to Austin McLanahan, Baltimore, Md. Comprises a series of successively operated relays.

**1,197,552. Electric Fluid-Heater.** M. H. Schoenberg, assignor to Majestic Electric Development Co., San Francisco, Cal. Special arrangement of resistor in tubular container.

**1,197,555. Incandescent Lamp.** T. J. Shonley, Leavenworth, Kans. Sectional filament structure.

**1,197,562. Safety Device for Electric Switches.** W. J. Stamm, Lehighton, R. L. Eustice, Nesquehoning, and G. Gardner, Lansford, Pa. For protecting operator of knife-blade switches.

**1,197,563. Automobile Safety-Signal.** R. A. Stierlin, St. Louis, Mo. Details of indicator plates and alarm interlocked with spark switch.

**1,197,567 and 1,197,568. Cinematograph Target Apparatus.** F. W. Weeks, assignor to L. B. Koch. Electrically driven and controlled.

**1,197,572. Lighting System for Automobiles.** J. Bijur, New York, N. Y. Has vibratory-contact regulation.

**1,197,548. Electric Controller.** J. H. Hall, asignor to Electric Controller & Mfg. Co., Cleveland, O. Relay control of starting resistance.

## PATENTS EXPIRED.

The following United States electrical patents expired September 12, 1916:

632,707. Electric Arc-Lamp. T. M. Foote, Chicago, Ill.

632,709. Telephone System. S. B. Fowler, Tarrytown, N. Y.

632,716. Controlling and Regulating Mechanism for Engines. T. H. Hicks, Ft. Wayne, Ind.

632,733. Insulator for Trolley-Wire Supports. J. W. Meaker, Waukegan, Ill.

632,739. Electric Meter. E. Oxley, Lynn, Mass.

632,749. Telephone Switchboard. F. M. Richter, Chemnitz, Germany.

632,759. Telephone System. J. C. Slater, St. Louis, Mo.

632,772. Trolley. R. White, Toledo, O.

632,805. Automobile. W. R. C. Corson, Hartford, Conn.

632,849. Trolley Wheel. E. M. Putnam and W. Sellers, Haverhill, Mass.

632,868. Electric Lock. J. R. Francis, Monroe, W. Va.

632,873. Voltaic Battery Cell. H. de Rufz de Lavison, Neuilly, France.

632,874. Controlling of Electric Motor Vehicles. H. Leitner, London, England.

632,896. Combined Engine and Dynamo. C. C. Cowan, Memphis, Tenn.

632,897. Combined Engine and Dynamo-electric Machine. C. C. Cowan, Memphis, Tenn.

632,932. Electric Brake. J. E. Williamson, Allegheny, Pa.

632,964. Electric Call-System. H. M. Dumas, Detroit, Mich.

632,970. Electric Indicators. F. B. Pope, Augusta, Ga.

632,973. Conduit for Electrical Conductors. M. O. Spring, Philadelphia, Pa.

632,980. Electric-Railway Switch. C. E. Young, Akron, O.

633,039. Detachable Connection for Electric Fixtures. S. G. Read, Bridgeport, Conn.

633,056. Anode. A. L. Walker, Perth Amboy, N. J.

633,060. Electrode. M. Wuillot, Brussels, Belgium.

633,064. Mine Locomotive. D. L. Barnes, Chicago, Ill.

633,090. Engine Stop Mechanism. L. St. Peter, Springfield, Mass.

633,095. Automatic Device for Operating Electric Switches. I. Deutsch, Baltimore, Md.